THE

JOURNAL

OF

GAS LIGHTING,

WATER SUPPLY,

ETC.

VOL. CXI.

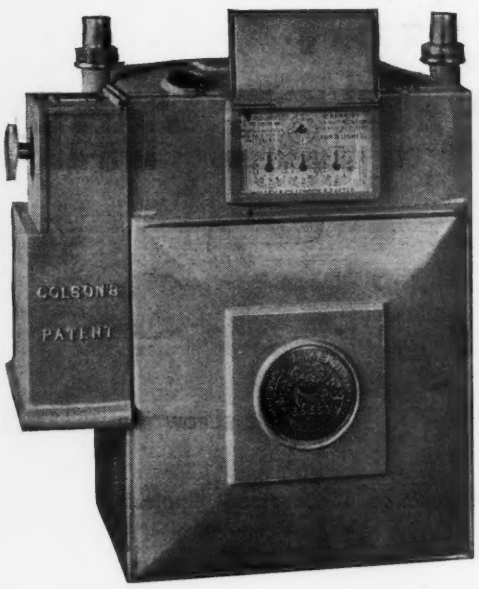
JULY TO SEPTEMBER, 1910.

LONDON:

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

1910.



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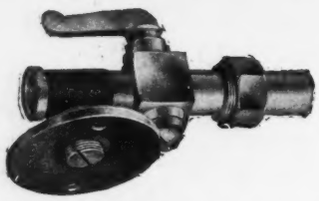
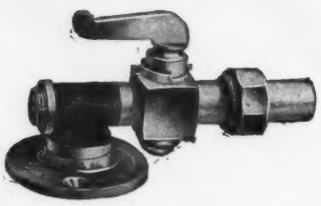


USED AS STRAIGHT-WAY TAP.



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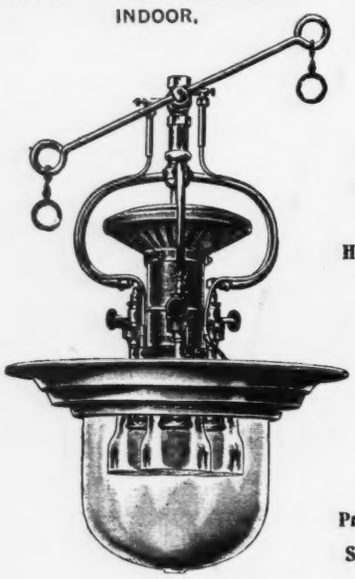

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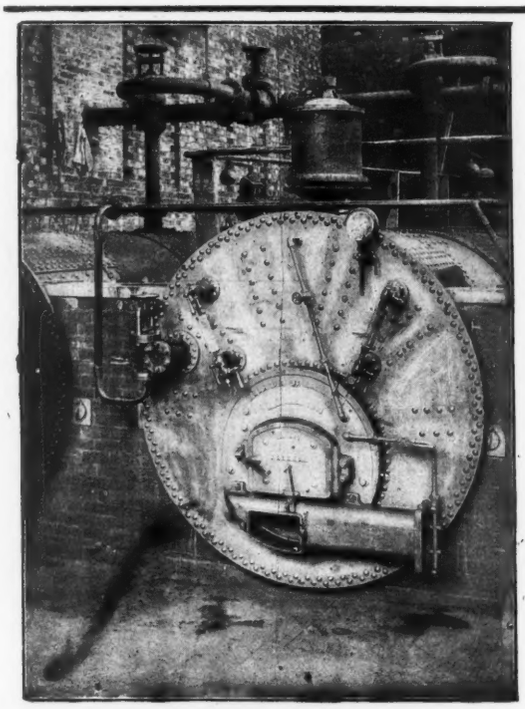

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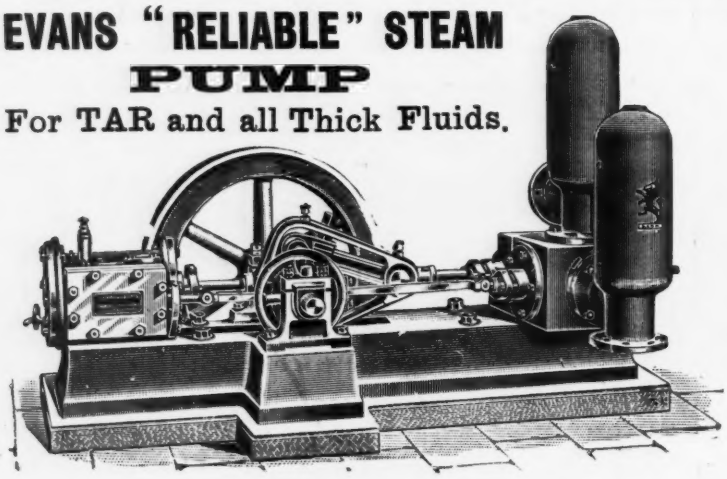

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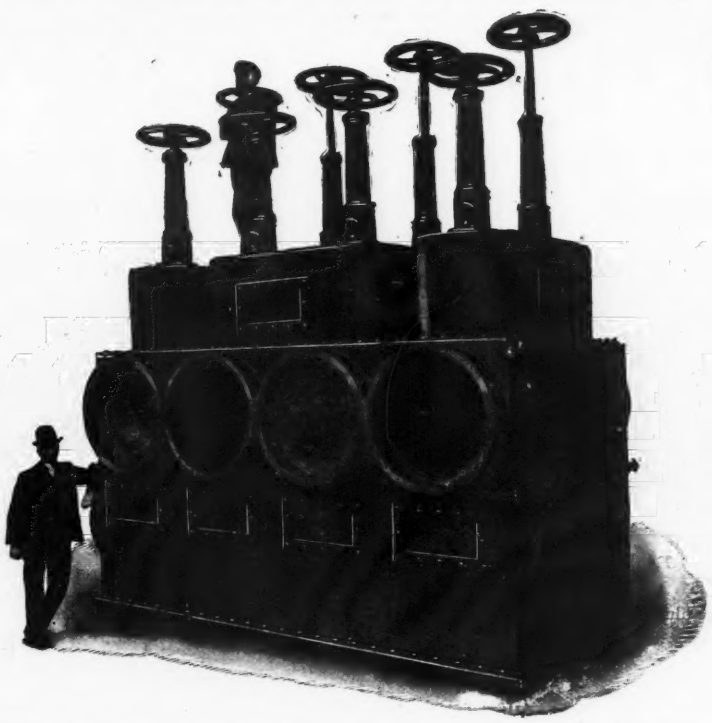

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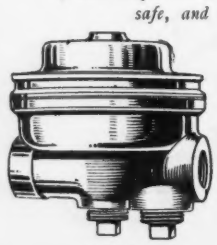

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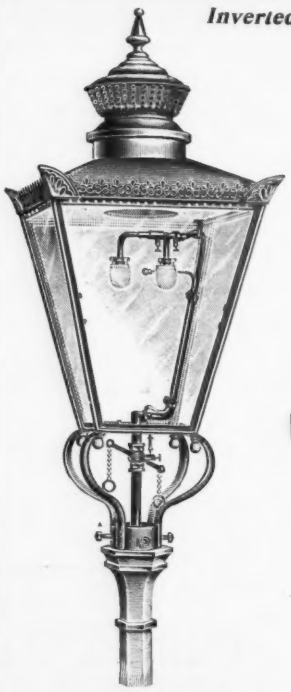

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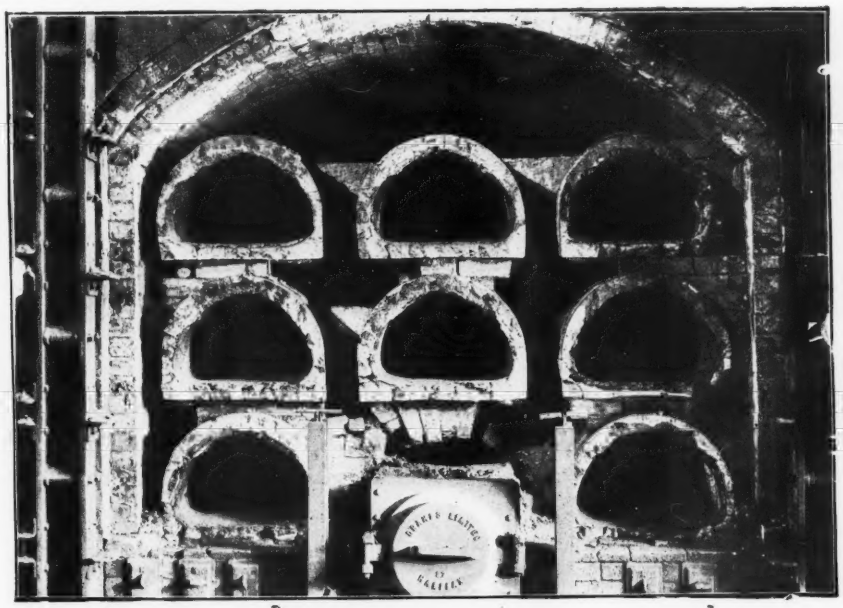

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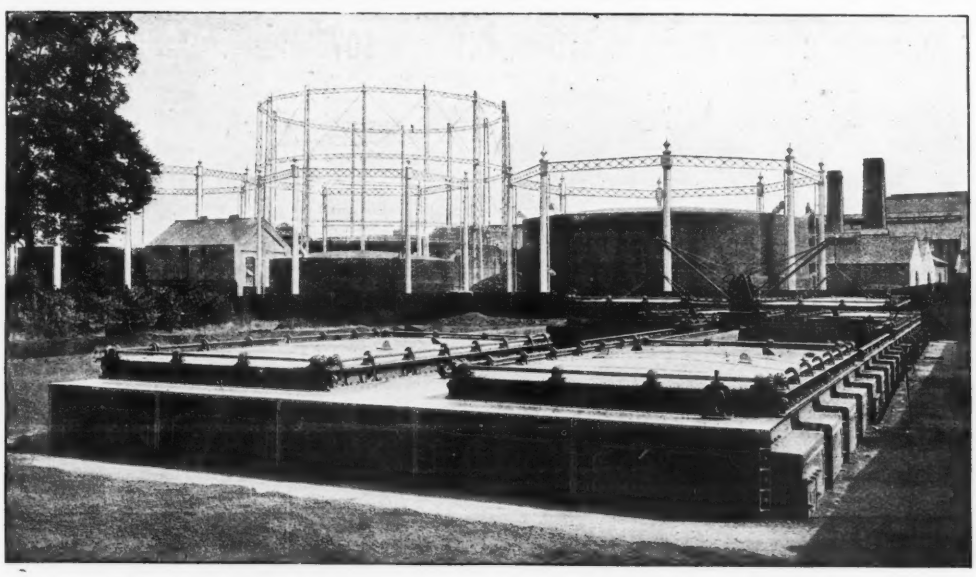

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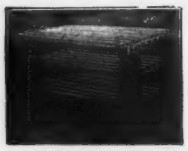

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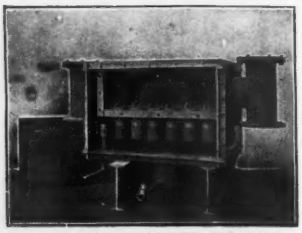

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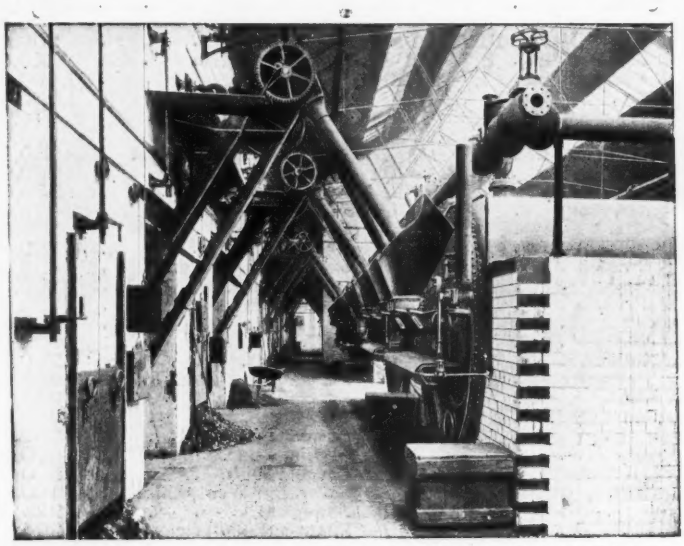

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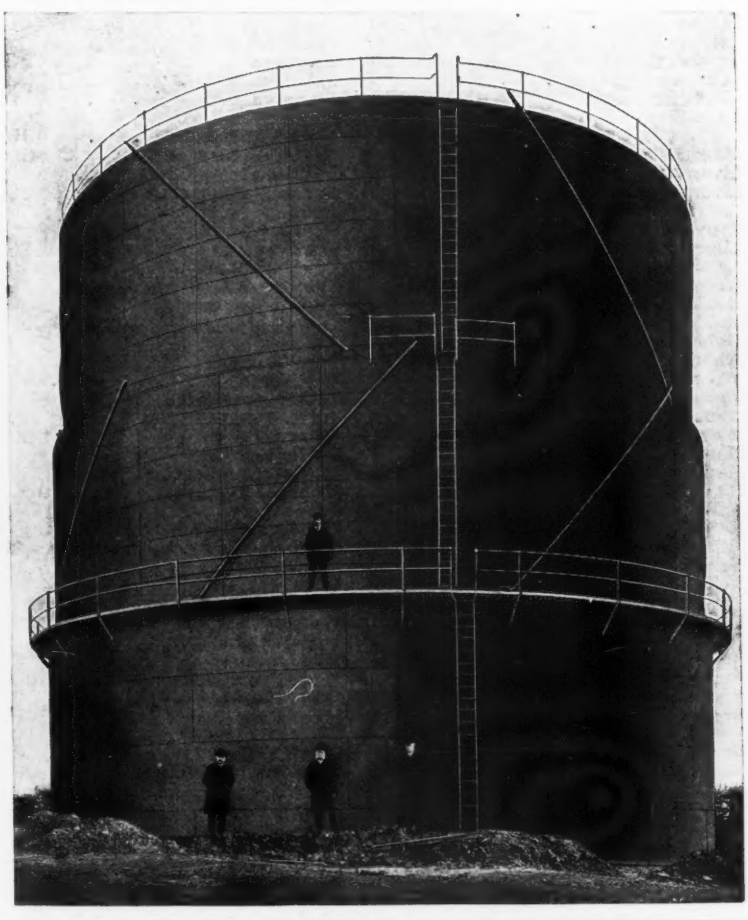

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Berlin—Tegel (2nd)	6,350,000	Guildford	350,000	Rotterdam (4th)	750,000
Bilston	375,000	Guildford (2nd)	200,000	Rotterdam (5th)	600,000
Birmingham	1,500,000	Haarlem, Holland	850,000	St. Albans.	700,000
Bishop's Stortford	200,000	Hamburg, Germany	1,750,000	St. Gallen, Switz.	225,000
Bochum, Westphalia	530,000	Hampton Court	500,000	St. Gallen (2nd)	225,000
Bognor	100,000	Hampton Court (2nd)	600,000	St. Joseph, Mo.	750,000
Bordentown, N.J.	125,000	Hartlepool	750,000	San Paulo, Brazil	700,000
Bournemouth	1,000,000	Hebden Bridge.	200,000	Santiago de Cuba	400,000
Bournemouth (2nd)	500,000	Heidelberg, Germany	200,000	Scarborough	800,000
Bremen, Germany	550,000	Holyoke, Mass.	600,000	Schweim, Westphalia	100,000
Bremen (2nd)	950,000	Hong Kong	450,000	Shanghai	225,000
Bremen (3rd)	850,000	Hull	1,500,000	Shanghai (2nd)	225,000
Brentford	1,200,000	Ilford	650,000	Shanghai (3rd)	1,600,000
Brentford (2nd)	850,000	Innsbruck, Austria	200,000	Southampton	800,000
Bridgwater	200,000	Ipswich	750,000	Southampton (2nd)	500,000
Bridlington	150,000	Kampen, Holland	350,000	Southampton (3rd)	600,000
Bridlington (2nd)	200,000	Kiel, Sleswig	1,000,000	Southgate.	400,000
Brieg, Silesia	100,000	Kiel (2nd)	880,000	Southport	750,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	Southport (2nd).	900,000
Brighton (2nd)	1,850,000	Lausanne, Switz.	250,000	South Shields	650,000
Bromley	1,500,000	Lawrence, Mass.	400,000	Stafford	500,000
Bruges, Belgium	200,000	Lea Bridge	350,000	Staines	600,000
Brussels—Anderlecht	350,000	Lea Bridge (2nd)	350,000	Stettin, Germany	880,000
Brussels—Anderlecht (2nd)	350,000	Lea Bridge (3rd)	400,000	Stockholm.	1,500,000
Brussels—Forest	1,000,000	Lea Bridge (4th)	1,000,000	Stockholm (2nd)	1,750,000
Brussels—Koekelberg	1,000,000	Leeuwarden, Holland	400,000	Stockport	600,000
Brussels—St. Gilles	1,000,000	Leiden, Holland	500,000	Stockport (2nd).	600,000
Brussels—St. Josse	1,000,000	Leiden (2nd)	575,000	Stockport (3rd).	400,000
Brussels—St. Josse (2nd)	600,000	Leigh, Lancs.	350,000	Stockton-on-Tees	500,000
Brussels—St. Josse (3rd)	775,000	Lemberg, Galicia	260,000	Swansea	750,000
Brussels—Ville	750,000	Lemberg (2nd)	500,000	Swansea (2nd)	1,000,000
Brussels—Ville (2nd).	750,000	Liége, Belgium	1,000,000	Swansea (3rd)	450,000
Brussels—Ville (3rd).	1,500,000	Liége (2nd)	750,000	Swindon	300,000
Brussels—Ville (4th).	350,000	Lincoln	500,000	Swindon (2nd)	450,000
Bucarest, Roumania	1,100,000	Liverpool	3,500,000	Sydney—Harbour	500,000
Budapest, Hungary	50,000	Liverpool (2nd)	4,500,000	Sydney—Harbour (2nd)	500,000
Budapest (2nd)	1,750,000	Liverpool (3rd).	750,000	Sydney—Mortlake	500,000
Carlisle	600,000	Longton	600,000	Sydney—Mortlake (2nd)	500,000
Carlsruhe, Germany	500,000	Louvain, Belgium	800,000	Syracuse, N.Y.	850,000
Chigwell	350,000	Lübeck, Germany	400,000	Taunton	225,000
Chorley	300,000	Maastricht, Holland	200,000	Taunton (2nd)	350,000
Commercial, London	850,000	Magdeburg, Germany	1,400,000	The Hague Holland	1,000,000
Commercial (2nd)	850,000	Maidenhead	225,000	The Hague (2nd)	500,000
Commercial (3rd)	1,250,000	Maidenhead (2nd)	225,000	Tilburg, Holland	400,000
Commercial (4th)	2,000,000	Maidstone	500,000	Torquay	350,000
Copenhagen	700,000	Malines, Belgium	500,000	Tottenham.	750,000
Copenhagen (2nd)	2,500,000	Malmö, Sweden	350,000	Tottenham (2nd)	750,000
Courtrai, Belgium	250,000	Malta	400,000	Tottenham (3rd)	350,000
Coventry	600,000	Manchester	3,500,000	Tottenham (4th)	1,000,000
Coventry (2nd)	600,000	Manchester (2nd)	3,500,000	Tottenham (5th)	1,000,000
Cracow, Galicia.	200,000	Mansfield.	330,000	Tottenham (6th)	1,250,000
Cracow (2nd)	200,000	Marlborough	100,000	Tunbridge Wells	1,000,000
Crefeld, Germany	500,000	Mayence, Germany.	700,000	Utrecht, Holland	1,000,000
Croydon	1,250,000	McKeesport, Pa.	500,000	Utrecht (2nd)	1,000,000
Croydon (2nd)	625,000	Merthyr Tydfil	300,000	Verviers, Belgium	1,000,000
Croydon (3rd)	625,000	Middlesbrough.	1,250,000	Vienna	3,500,000
Croydon (4th)	550,000	Namur, Belgium	175,000	Vienna (2nd)	2,500,000
Debreczin, Hungary.	100,000	Nelson	400,000	Waltham	400,000
Deventer, Holland	150,000	Newburgh, N.Y.	600,000	Wandsworth & Putney	1,800,000
Deventer (2nd)	200,000	New York.	5,200,000	Watford	300,000
Dorking	150,000	Nictheroy, Brazil	250,000	Watford (2nd)	350,000
Dublin	2,000,000	North Middlesex	150,000	Wellington, N.Z.	350,000
Dublin (2nd)	2,000,000	North Middlesex (2nd)	200,000	West Bromwich	550,000
Dublin (3rd)	650,000	North Middlesex (3rd)	75,000	West Ham	1,500,000
Dundee	1,500,000	Norwich	1,000,000	West Ham (2nd)	800,000
Dunedin, N.Z.	150,000	Norwich (2nd)	300,000	Weston-super-Mare.	350,000
Dunedin, N.Z. (2nd)	275,000	Norwich (3rd)	500,000	Weston (2nd)	350,000
Durham	200,000	Nottingham	1,000,000	Wexford, Ireland	100,000
Düsseldorf, Germany	1,000,000	Nottingham (2nd)	1,000,000	Wiesbaden, Germany	850,000
Eastbourne	1,250,000	Nuneaton.	125,000	Winchester	225,000
Edinburgh	2,000,000	Oberhausen, Germany	175,000	Winchester (2nd)	125,000
Epsom	225,000	Oldenburg, Germany	200,000	Wolverhampton	1,500,000
Epsom (2nd)	300,000	Ostend, Belgium	100,000	Zwolle, Holland.	200,000
Falmouth	150,000	Ostend (2nd)	200,000	Zwolle (2nd)	200,000

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXI., No. 2460.—TUESDAY, JULY 5, 1910.

EDITORIAL NOTES—GAS, &c.

The Commercial Situation.

IT does not matter to what quarter we look—whether it be at home, or Germany, France, or other Continental countries, or further afield in Australia, at the Cape, or in North or South America—we see the same vigorous consideration being paid to the commercial interests of the gas industry. This indicates, without further explanation, that the gas industry everywhere has been thrown completely open to more strenuous competition, and increasingly so, in both its primary and secondary products. The industry, however, is fortunate in that the magnitude and diversity of its business place in its hands a power that its competitors do not, and cannot from the very nature of their productions, possess. The magnitude and diversity of business must be maintained and extended by every possible means; and one of the means is by the production of cheap gas of suitable and fairly uniform calorific power. On this point of uniformity of calorific power, we see Professor J. T. Morris, of the East London College, is still hammering away at the question of the (so he supposes) variable calorific power of gas in different parts of London—a matter to which reference was made in our "Electric Supply Memoranda" for June 14 last, in relation to some lamp tests made by Professor Morris two years ago. We think the Professor must have made his calorific tests during some temporary defection, because, in view of his statements, we have examined, over a long period, the official calorific returns signed by Dr. Frank Clowes, the Superintending Gas Examiner of the County Council; and between one part of London and another, there is not, in the results of this daily systematic testing, at twenty-two points of the Metropolitan gas-distribution system, any very marked variation between the gas in one district and another. But Professor Morris's statements in 1908, and his reiteration of them now in the face of fairly uniform official results, is doing the gas industry no good in its commercial work. The manufacturers of electric lamps are making use of his name and statements in their advertising literature; and when once a statement of the kind that is false in its general applicability obtains circulation, the ill-effects cannot possibly be entirely wiped out, no matter the amount of trouble and expenditure to which the industry and individual gas undertakings go in the attempt.

This by the way. Another means by which the magnitude and diversity of the business of the industry must be sustained and extended is by technical advances in the methods of using gas. We are not dissatisfied with the progress that is being made in this direction. It is good; and by the help that is being extended to the industry through scientific research, the future promises that the advances made in the methods of utilization will in themselves create a much larger use. The interests of gas suppliers and manufacturers are mutual in this respect. In the production of cheaper gas and in making technical advances in gas appliances, work is proceeding apace; but there is another thing we do urgently want in the gas industry—it is a development that has been much talked of of late—and that is a central agency in connection with the Institution to deal with publicity and with the subtleties, extravagancies, and public beguilements in competitors' propaganda. We know what is being done in aid of commercial gas work in America; and we are learning more about the Central Organization for the Promulgation of the Sales of Gas in Germany that was established in Berlin last March, and concerning which Herr Lempelius gave information at the annual meeting of the German Association, as noticed last week in our Review of the Proceedings. Herr Lempelius (formerly Manager of the Barmen Gas-Works, and who resigned the position to take up the management of the Central Organization) has been making a survey of all the promising fields for gas exploitation; and he has come to the conclusion that there is ample scope for development. For the work done by the Central Organization he also asks for funds; and his appeal (judging from the way gas research has been financed in Germany) will not, we think, fall on deaf ears. It is to be hoped that it will not be long before the British gas industry as a whole wakes up to the necessity of doing something, and something of a worthy and effective character, in this direction; for it is seen that every day produces fresh work that it is fatal to set aside to be dealt with at (that common refuge of procrastinators) a more convenient season.

We may echo the claim of Herr Prenger, of Cologne, the President of the German Association, that the gas industry should now be allowed free scope to work their undertakings as commercial enterprises. Gas enterprise has now to shoulder all the responsibilities of the ordinary tradesman, and more; but it has not the same freedom. We also endorse his view that, in the interests of both undertakings and communities, all gas undertakings should be relieved of the incubus which the demand for heavy and constant contributions to the municipal chest lays upon them. But there will have to be a fearful wrench on the part of municipal bodies before they will part with this handy source of revenue, however desirable the act may be. The chief point, however, is that the recording-finger of our technical and other organizations the world over directs to the universality of the commercial tensity; and we in this country must not be behind other countries in meeting the situation. One of the ways of doing this is by active co-operation.

The Economic Aspects of Calorific Power.

No one can read the reports published in the "JOURNAL" last week of the meetings of the German Association and the French Society (especially the former) without being struck with the important place that calorific power is destined to play in the future in the economics of the gas industry, both in regard to manufacture and utilization. The papers which are chiefly in mind, it must be said, are more directive and constructive than conclusive, though they are conclusive in so far as the lessons derivable from them are concerned. In the first place, it is clear, from the technical investigation and experience that are presented from these meetings, that, if we can put an end to the British gas industry's detention by the illuminating power standard, and have a reasonable calorific power standard (conformable with local conditions) applied, there will be ability to draw coal supplies from more extensive sources; and, in the second place, the new methods of carbonization will, at the same time, assist in producing compensations, in connection with residual products, for any depreciating effect that, under the old circumstances of gas-works carbonization, might arise from the employment of the lower grade varieties of coal. We anticipated—the anticipation is being realized—that from the Instructional and Experimental Gas-Works at Carlsruhe, under the superintendence of Dr. Karl Bunte, there would issue much that will be valuable in the technical and commercial progress of the gas industry. There will be no disappointment in this regard; and the German Association deserve the thanks of the universal gas industry for what they have done, and what they are doing.

Already we are being shown that the calorific value of British gas coals (which are largely used in Germany) does not vary to such an extent as we know the illuminating power of the gas varies that is obtained from the different varieties; and the work at Carlsruhe is assisting in placing more and more in view the conditions that are desirable in recovering greater proportions of the calorific power of the coals used in the form of gas, and generally in broadening the operating ground and resources of the industry. Take the raw material itself, much systematic research has taken place there into different varieties of gas coal; and Dr. Karl

Bunte's "Information about Gas Coal" (p. 957) should be read in conjunction with the report from Carlsruhe on the "Chemical Composition and Calorific Power of Gas Coals." Dr. Bunte lays down a principle that will be acceptable to all gas makers, that a coal is the more valuable the greater the proportion of its calorific value that can be recovered in the form of gas. The property of calorific yield is what will have to be tested in future in the purchasing of coal when the British gas industry is no longer tied to the effete standard of illuminating power. But at the same time we must not, in seeking to recover in the form of gas a larger proportion of the calorific value of the coal, neglect altogether consideration for the coke, though seeing that this residual, speaking broadly, retains two-thirds of the original calorific power of the coal, there can well be without substantial injury a transference of a part of the calorific power to the prime commodity of the industry. Admittedly, the coal that will yield the greatest proportion of its calorific power in the form of gas is the best for the gas maker; but there are operations in the process of recovery that will contribute to the enhancement or degradation of the calorific result. As a rule, coals will yield more of their calorific power in the form of gas the more recent in origin they are at the time of carbonization; and experience of recent times has also taught us that the method of carbonization does make a difference in the calorific value of the gas produced. Though the illuminating power of gas may be appreciably diminished by one system of carbonization compared with another, it is quite possible for there to be an increase in the calorific power. But more on this point presently.

The authorities at the Instructional and Experimental Works of the German Association are to be thanked for the publication (with the names of the coals) of the results of investigations into the chemical composition and calorific power of certain well-known varieties of English gas coals. Confession must be made that published data obtained from uniform and systematic research as to the character of a representative number of our home gas coals do not possess that character for modernity that is advisable, now that, in so many districts, some of the more qualitatively lucrative seams are giving out. The tables that we published on p. 962 last week are therefore peculiarly interesting under present circumstances. In the column giving the results of calorific power in B.Th.U. per pound of coal, the figures show remarkable uniformity in the calorific values of the many Durham coals tested, while those for Yorkshire coals run but little lower, and the only Scotch coal tested comes last but one in the whole of the varieties that were tested from any source. The tables do not go the length of telling us which of the coals will yield the greatest proportion of their calorific value in the form of gas; and probably, even at the Carlsruhe experimental works, they are hardly in a position to tell us this (through lack of the necessary plant) under the various new methods of carbonization. We know what excellent calorific power results (with low illuminating power) are obtained in Berlin practice with the vertical retort system; and much was heard last week about the regularity of the hourly production of gas and of its calorific power from the chamber settings at Königsberg. In the paper by M. Paul Parsy before the Société Technique, he was talking of productions, with the Klönne chambers at Rotterdam, of 12,316 cubic feet of gas per ton of 616 B.Th.U. gross; and high yields are noticed elsewhere—at Padua and at Frankental. In the table (p. 950) in M. Parsy's paper, he shows that invariably a very much greater number of calories is obtained per ton of various coals carbonized in chamber settings compared with ordinary retort-settings, though we should like to know something more about the type of the latter, and whether heavy or light charges were used. There is nothing much said in the paper about illuminating power; but we see in one of the diagrams referring to the Rotterdam installation that, in twelve-hour charges, it varies from (in one instance) 6 to 22·9 Hefner units, with an average of 15·55, and in another from 15·7 to 23·5 Hefner units, with an average of 18. However, illuminating power is not the subject of this article. In these days in the gas industry, we are looking forward.

If we turn from the question of the production of gas of high calorific power to its use, some interesting information is to be obtained from the paper by Dr. Max Mayer, treating of the valuation of coal gas according to its calorific power. From this it will be seen that his researches have led him to the conclusion that, within certain calorific power limits, M. St.-Claire Deville's contention is justified—that the illuminating power of a gas mantle is proportional to the calorific power of the gas used. But the reverse is also proved when it is seen that, with lower calorific power gases, higher illuminating efficiency is secured; this being due to the chemical composition of the gas. "The rich gases, "containing more heavy hydrocarbons, show a lower duty, "probably because of the smaller intensity of the combustion "of these hydrocarbons."

We have said enough here to show that there is in these Continental meetings—especially that of the German Association—a large amount of material of educational value, bearing upon the economics and future of the gas industry; and the information is of a character that might with advantage be absorbed by those who are obsessed by feelings of righteousness and sentimental affection for gas consumers (while the consumers do not care a single straw about the matter, being free agents in respect of their patronage) in connection with the change over from the old test-burners to the new one. There is evidence and to spare, too, that the transition from an illuminating power standard to one of calorific power will redound to the economic benefit of the gas industry.

The Excellently Paid Gas Worker.

The gas worker has nothing to complain of concerning wages and hours of labour, and regularity of his employ. Taking the whole number of gas workers of all classes, there is no doubt the altered conditions of gas utilization have been the means of greatly levelling-up the continuity line of employment. And regarding wages and hours, an interesting report has just been issued by the Board of Trade on the results of an inquiry instituted in 1906 into the earnings and hours of labour of the working classes throughout the United Kingdom. It is true that the figures, applying to 1906, have a somewhat remote appearance; but, in the past four years, there have not been any particular changes in the rates of pay of the classes of labour to which the statistics refer, so that their illustrative value remains. We have always claimed, seeing that it was subject to easy proof, that the gas industry has ever been a good employer; and the figures before us, bearing official seal, give the confirmation, though referring only to employment under local authorities. These bodies in these democratic days, when labour has large representation in local government, are often charged with paying higher wages, and getting less work from the men in the various branches of their service, than do private employers, simply through the power of the labour vote and representation. But in connection with gas supply, the charge has less application than in certain other branches of municipal service; for in districts comparisons between one works and the neighbouring ones of rates of pay and hours of labour, usually afford a sort of governing basis that brings about an approximation of actual figures where conditions are somewhat alike.

The classes of employ treated upon in the returns refer to road and sanitary work, gas supply, electricity supply, water supply, and tramway and omnibus work. Alluding only to the last four branches of municipal work, inasmuch as they are the four in which there is best payment, the men (excluding all lads and boys) who worked full time in gas supply obtained an average pay per week of 32s. 6d.; in electricity supply, 31s. 7d.; in water supply, 28s. 8d.; in tramway and omnibus work, 30s. 6d. The total number of gas workers to whom the returns relate is 68,234; of electricity supply men, 13,347; of water-supply men, 14,093; of tramway and omnibus men, 46,702. Now there are two points about these statistics of which the part of the workers of the country who are so ardently in favour of municipalization, and those representatives of labour who so consistently advocate everything possible being done that is in favour of electricity supply, and everything possible that is unfavourable to gas supply, should take special notice. The first is that, in the average rate of pay, gas supply stands at the head; and the second is that, though urban electricity supply is in greater part municipally controlled, gas supply gives the means of a considerably greater employment than electricity supply. For this reason alone, it has always been a mystery to us why representatives of labour on local bodies should seek to injure the better employment market, to benefit that which affords but comparatively small scope for employment.

Pursuing the statistics, it is observed that the average earnings for full time of men employed in connection with gas supply were 34s. 3d. in the large towns and 29s. 4d. in

the smaller ones. In the large towns, of the men who worked full time, 34·2 per cent. earned less than 30s, and 24·2 per cent. 40s. and above; compared with, in the smaller towns, 53·4 per cent. earning less than 30s., and only 9·5 per cent. 40s. and above. Then, looking back, it is found that the rate of pay in gas supply has made substantial progress. In 1886, similar investigation was undertaken; but, unfortunately, there are no corresponding figures for electricity and tramway and omnibus services. In respect of gas supply, however, the average full time earnings in 1886 were 26s. 10d., compared with 31s. 7d. in 1906—showing an increase of 17·7 per cent. In water supply, the corresponding figures are 24s. 6d. and 28s. 3d.—a percentage increase of 15·3. The gas-supply industry should indeed, in the eyes of labour, be the very paragon of virtue in regard to the treatment of its workers. The wages, the increase shown in payment, and the scope for employment, give to the industry the capital place in connection with the municipal services. As to the average hours of labour per week, there is little difference between gas and electricity supply—the respective figures being 52·6 hours and 51·9. Those engaged in the water-supply service, put in an average week of 55·1 hours. From our point of view, the return is a most satisfactory one as an indication of the excellent position occupied by the gas worker.

Mr. John Burns Favours Cheap Gaseous Fuel.

MUNICIPALITIES owning gas undertakings and using them as the channel for lifting money from the pockets of the consumers of gas for relieving the rates, must mind their P's and Q's. Not only is Parliament on their track, but the smoke nuisance abolitionists have turned the eyes of the Local Government Board and of the public upon them, and are resolved to do what they can to put an end to the robbery of the gas consumers, in order that the municipal gas undertakings may be placed in a better position to serve the object of their own actively prosecuted crusade. In this crusade, they have not, through their own particular lines of action and limitations, scored much success. We fear that, excepting perhaps through one suggestion made last week by a deputation to the President of the Local Government Board, their general proposals regarding legislation will not prove very effective; but, with Mr. John Burns, we do think that much more will be done by technical progress to gain the object in view. The economies of technical progress serve as very cogent arguments; and if the manufacturer can be shown how he can save money and obtain additional convenience by the adoption of gas heating and gas-engines and electric motors, and the householder how he can have greater convenience and economy than now, there will come about gradually, by such means, that purification of the atmosphere that the adherents to the smoke abatement movement are ever so desirous of seeing. This is one of those improvements in human conditions, with acknowledged sanitary and physical advantages, that cannot be effected by any revolutionary methods. It would be impracticable to apply to it a too drastic exercise of the arm of the law; and, while heartily sympathizing, Mr. Burns is of that way of thinking.

The members of the deputation whom he so courteously received, and on whose side he ranked himself, though not decisively in respect of ways and means of arriving at the long-sought goal, have done much to bring the matter of air pollution and purification to the notice of the Government and of the public; and in this they have done well. They urged general legislation on the lines of that proposed in the London County Council Bill (which has just been under the consideration of a Commons Committee, and which has been unsuccessful in the matter of eliminating the qualifying word "black" that appears before "smoke" in present legislation), high and cumulative fines for default, inspection by competent men, and other things. But the suggestion of more immediate interest to us is the one in their memorial which reads: "Believing that cheap gas will be a large "factor in the ultimate solution of the smoke question, "we trust that the Board, in dealing with the borrowing "powers asked for by gas undertakings, will absolutely "prohibit the pernicious practice of selling gas dear to "relieve the rates. This leads to wasteful expenditure, is "unfair to large users of gas, and prevents the development "of this clean and civilized way of obtaining heat and "power." Parliament has been working to that end (as witness the Salford Bill, the Oldham Act, and the Glasgow Bill) in this and last session; and the pointed reference to the subject by the deputation, will give strong support to the new parliamentary policy. Mr. Burns said frankly that he fully sympathized with this particular view of those who had sought his assistance; and his words show—if it was not plain to all before—which way the legislative wind has set in the matter of the curtailment of abused liberty. If local facts were within the knowledge of Mr. Burns, it must have been interesting to him to hear Mr. Councillor Smith, of Glasgow, denouncing the taking of gas profits for the relief of the rates, and then to have before him Mr. Alderman Fildes, of Manchester, in which city not only are gas profits taken, but reserves have to be broken into, to satiate the municipal mania for rate relief. The Alderman spoke of the staff of inspectors that is maintained in smoke begrimed and enveloped Manchester; but he did not say why it is that Manchester does not render it largely uneconomical to use smoke-producing fuels by making it more economical to employ gaseous and therefore smokeless fuels.

With practical foresight, Mr. Burns had been to the trouble of informing himself what part the Gaslight and Coke and South Metropolitan Gas Companies had taken in relieving the atmosphere of London of its miasmatic conditions; and he had learned that of gas-fires, gas-cookers, ring-burners, and hot-water heaters—not counting privately purchased ones—the two Companies (omitting the Commercial Company) had fixed no less than 1,300,000. Such a considerable displacement of solid fuel as this represents has assuredly worked substantial good for London; for the myriads of domestic chimneys must be as harmful as, if not more so than, the lesser number of factory chimneys, though individually the latter may be equal to several active members of the less (individually) prominent order. This inquiry on the part of the President no doubt gave strength to his view that more good in regard to smoke suppression may be anticipated from the progress of facilities for using gaseous fuel than from any general legislation. This being so, Parliament will be conferring public advantage by relieving the gas industry of repressive legislation, and by discountenancing, in the case of gas companies, the demands of electricity-competing local authorities that aim at, and can only have the effect of, deterring that progress which is admitted by thinking men to be to the benefit of the public.

Some More Municipal Gas-Works Results.

Since reference was last made in these columns, some few weeks ago, to the results which have attended the past financial year's working of gas undertakings owned by local authorities, there has been a large call on the space in our news section for the setting forth of further statistics. The features which first claim attention vary according to the circumstances of different cases. But reports are, collectively and individually, of a satisfactory character; and it looks as though it will be long ere gas yields up the excellent position which it has so long held among the records of municipal trading departments. There is a balance at Bolton to carry to the profit and loss account of £49,788, compared with £50,398 the previous year; and out of a net balance of £24,243, the Committee have voted £20,000 in aid of the district rate. The gas made was 986 million cubic feet, against 970½ millions in 1909. A net profit of £18,191 is reported from Coventry, compared with £2296; and the Engineer (Mr. Fletcher W. Stevenson) has been given a considerable increase in his salary. Of the profits, £4000 is to be paid over to the general district fund in aid of rates, £13,000 set aside towards meeting the loss of capital occasioned by the abandonment of the old works, and £430 applied to the payment of a bonus to workpeople in the department. The price of gas is also to be reduced 1d. per 1000 cubic feet to ordinary consumers, and 2d. to prepayment meter users. Devonport has had one of its most profitable years as a municipal gas undertaking, with an increase of 4½ per cent. in the sales of gas, and a net profit of £3474. Since 1903, the first year in which the Corporation had control of the undertaking, the unaccounted-for gas has decreased from 7·1 to 2·1 per cent. The accounts of the Edinburgh and Leith Commissioners show a net balance of £30,774, and an increase in the quantity of gas sold of 80 million cubic feet. Consequent, however, on a reduction in price, the revenue from gas is less by £2894 than the preceding year—a falling off which was about balanced by a greater return from residual products. The report and balance-sheet at Hebden Bridge are stated to be "very favourable indeed." There is a bigger gross profit, partly owing to the lower cost of coal, and

partly to an increased make per ton, against which, however, had to be set a reduction in the price of gas. The gross profit at Leeds is £98,321, against £95,587 a year ago. The rates will benefit to the extent of £6000. There is a falling off in the sale of gas of 3¼ per cent.—attributable to depression in trade, larger use of incandescent burners, and also the extraordinarily bright winter. Naturally, the report is considered satisfactory by the Committee, seeing that there is a substantially larger gross profit, in spite of a falling off of 99 million cubic feet in the quantity of gas sold. At Lincoln, there is a gross profit of £14,235, compared with £12,996 for the preceding year. Of the net profit of £6300, a sum of £3000 is to go to the rates. The gas supplied was 8¼ million feet more than in the previous year, following an increase of 13¼ millions reported twelve months ago. This, again, is regarded as very satisfactory, considering the competition of the Electricity Committee.

The new Committee of the Council of the County Borough of Stoke-on-Trent also regard the accounts of the Longton Gas-Works for the past financial year as being "very satisfactory." Certainly, there are two or three salient features about the results which cannot be looked upon as anything else than eminently satisfactory. In the first place, the make of gas per ton of coal—12,900 cubic feet, of an average illuminating power of 15·8 candles, tested with the No. 2 burner—constitutes a record; as also does the sale of 12,100 feet per ton. Then the figure for leakage (for a mining district) is small, at 4·59 per cent. The price of gas during the whole year was 2s. 6d. per 1000 cubic feet for lighting, and from 2s. 3d. to 1s. 9d., according to quantity, for power. By the new Act federating the Pottery Towns into the united County Borough of Stoke-on-Trent, gas has to be sold at cost price; and the price at Longton has therefore been reduced to 2s. 1d. per 1000 cubic feet. Under the old conditions, cottages have been supplied with slot meter and fittings at the rate of about 300 per annum; and in this way, 2200 consumers have been added, and the installations paid for out of revenue. A remarkable fact about the Longton gas undertaking is that there are about 5800 slot consumers and only 1637 ordinary meter users. The gas sold last year was 1·9 per cent. more than in the preceding twelve months. A sum of £5000 has been paid over to the borough fund in relief of the rates, compared with £3000 for the previous year. The gross profit at Market Harborough remains about the same at £2700; a reduction made in the price of gas a year ago having adversely affected the revenue. Coal cost less, though the production of gas increased by nearly 2 million cubic feet; the make being 11,800 cubic feet per ton, against 11,567 feet the twelve months before.

Better trade has led to an increased consumption at Ossett; but the growth has been checked by the more general use of incandescent burners. A good feature of the accounts is the fact that, though the sale of gas last year was a record one, the make was not; there having been a great saving in unaccounted-for gas. There is a good showing, too, at Smethwick, where the consumption through prepayment meters has gone up 9·28 per cent.; small ordinary consumers have taken 2·28 per cent. more; and there is an increase of 2 per cent. in the quantity supplied for public lighting. On the other hand, a slight reduction is shown in the large consumers for lighting; but the quantity sold for power and manufacturing purposes is recovering. The total quantity sold shows an increase of 2 per cent. Public lighting supplied free of charge is valued at £4367; and £1000 was contributed to the cost of the new Council House. At Stafford, the unaccounted-for gas has reached the lowest figure in the history of the concern—1·07 per cent. The gross profit was £15,281, as compared with £14,754 preceding year. Under the profit-sharing arrangement, the clerks and workmen get a bonus of 9·25 per cent. on their wages; reductions are made in the charges for gas; and a sum of £3500 goes in relief of the rates. Stourbridge gives £1880 to the rates; and a feature of the accounts is the reduction of leakage. Sales of gas show an increase of 7½ million cubic feet; while the make has increased by less than 4 millions. This means a reduction in the unaccounted-for gas of almost 2 per cent. on the amount made. In seven years, at Teignmouth, there has been an increase of 75 per cent. in the output of gas; and reductions in price are the order of the day. The make of gas at Wolstanton was 12,255 cubic feet per ton. There is a sum of £4747 to go to the profit and loss account.

The Report of the Chief Inspector of Alkali Works.

The annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued yesterday, and some extracts from it will be found elsewhere. It is the forty-sixth of the series, and deals with the proceedings during the past year of the Chief Inspector and his various colleagues who have the supervision of districts. It is satisfactory to find it recorded that, though 1857 works were under inspection, involving 5600 visits and the making of 6252 tests, no action had to be taken against the owners of registered works for infraction of any of the penal clauses of the Act; and testimony is borne to the readiness with which manufacturers meet the requirements of the Legislature. The report contains, as usual, statistics, furnished to the Chief Inspector, in regard to the production of ammonia from all sources in the United Kingdom last year. They show an increase in all cases but gas-works, the supply from which fell off to the extent of about 1000 tons. Coke-oven works, on the other hand, furnished upwards of 18,000 tons more. A large portion of the report is occupied with a continuation of the important series of studies in coal carbonizing, which have of late years occupied the Chief Inspector and his Assistant (Mr. S. E. Linder, B.Sc.); the interaction of methane and ammonia in the presence of carbon being investigated. Although the report bears the signature of Mr. R. Forbes Carpenter, he was unfortunately unable, owing to continued ill-health, to do more than supervise its preparation by Mr. Linder. He has now, as readers are aware, relinquished the position of Chief Inspector, which he had held since the retirement of Mr. A. E. Fletcher in 1895. These annual reports have always had a certain amount of interest for our readers; but it has increased immensely of late years, owing to the investigations bearing upon matters affecting the gas industry initiated by Mr. Carpenter, a fitting recognition of which was recently made by the Institution of Gas Engineers by his election as an honorary member. It may be hoped the new Chief Inspector, Mr. William S. Curphey, will have opportunities of continuing the work of his predecessor in the direction indicated.

The Eight Hour Act Again.

Once more, it seems, South Wales coal miners are between the—coal owners and the Miners' Federation of Great Britain. The new wages agreement recently signed for that field, by one of its clauses, provided for overlapping shifts being worked when required by the owners—the first shift starting at 6 a.m., and finishing at 2 p.m.; and the second starting at 9 a.m., and finishing at 5 p.m., which gave eleven hours continuous winding, and also time for repairs to machinery, &c. So far so good; but the second shift men raised a problem by refusing to work later than 2 p.m. on Saturdays, thus making their shift one of five hours, which the owners declined to regard as a day's work. Hence the clause referred to was made to provide that on Saturdays the second shift should start and finish at the same time as the first shift. But inasmuch as an earlier start would be impossible under the present Act for the men who finished at 5 p.m. the preceding day—in view of the section which prohibits any miner from entering the pit for a second shift of eight hours within one period of twenty-four hours—it was understood that the miners and owners would co-operate in supporting an amending Bill, in order to get rid of the obstacle. The Board of Trade were approached; and the President undertook, conditionally on the miners agreeing to the settlement, to introduce a measure to legalize the beginning of the working shift on Saturday within the twenty-four hours from the starting of work on Friday morning. In these circumstances, a conference of the Miners' Federation of Great Britain was held last week to consider the position and determine whether the Federation should oppose any amending Bill, assist in getting it passed, or remain inactive. The decision come to was absolutely against the introduction of any amending Bill; for the conference agreed that any such measure should be opposed. Seemingly, their attitude is that the double-shift system has worked well elsewhere, and so should do for the South Wales miners—instead of any overlapping shifts. But the South Wales workers have entered into an agreement which they are now unable to keep—for it would be futile to introduce the amending Bill under existing circumstances. What are they to do? Will the men agree to work till 5 p.m. on Saturdays; if not, will the employers reopen the whole question of the settlement, on the ground that this enforced breaking of the terms

of the agreement by the men justifies fresh consideration of the entire matter? Probably this trouble will be surmounted as previous ones have been in connection with the Eight Hour Act; but in the meantime it affords still one more object-lesson on the shortsightedness of the Government in passing such a measure. The continuous friction which has been in evidence since the Act came into being, is, however, nothing more than might reasonably have been expected as the result of State interference with such a highly organized industry as that of coal mining.

The Nitrate of Soda Market.

The first six months of the present year have proved an active period for the nitrate of soda market; the world's consumption having amounted to 1,577,000 tons, compared with 1,273,000 tons in the corresponding period of 1909—or an increase of 24 per cent. Belgium took 20 per cent. more, France 16 per cent., and Germany 13 per cent. In the case of America, the increase is no less than 61 per cent., and Holland 51 per cent. The United Kingdom absorbed 10 per cent. more than in the corresponding period. In their half-yearly report, with a copy of which we have been favoured, Messrs. W. Montgomery and Co. give statistics of the growth of the nitrate industry through the past thirty-five years. In 1876, in the United Kingdom and the Continent of Europe, the consumption was 270,000 tons. During the ten years to 1886, the increase was 33 per cent.; while in the following ten years, the growth was no less than 166 per cent. From 1896 to 1906, the consumption went up 28 per cent.; and since the last-named year, an increase of 34 per cent. has been registered. In 1831, the world's consumption of nitrate—all of which was absorbed in the United Kingdom—was 100 tons. Up to 1876, Europe was practically the only consumer; but after this time, nitrate rapidly took a more prominent position in other places. For instance, in the United States, from 1882 to 1892 the increase in consumption was 66 per cent.; from 1892 to 1902, 90 per cent.; and from 1902 to date, 171 per cent. In "other countries," the increase in the period extending from 1896 to 1906 was 400 per cent.; and since the last-named year, an addition of 95 per cent. has been registered. Combination among producers has during the past six months received the usual amount of attention; but always with the same negative results. The consequence has been a period of low prices and, as already shown, large consumption. Prices during the half year have varied to the extent of about 10d. per cwt. for prompt nitrate in Chili, and 1s. 1d. per cwt. for arrived cargoes. Early in January the quotation for arrived cargoes was 7s. 11d. to 8s. per cwt., cost and freight; while the coming of June found the price of cargoes steady in the vicinity of 8s. 1½d. to 8s. 3½d. per cwt., cost and freight.

The Financial Aspect of Municipal Trading.

Reference was made last week to the Inaugural Address of the President of the Institute of Municipal Treasurers and Accountants, some of whose conclusions on the subject of municipal trading were briefly noted. This is a question which concerns officials of local governing bodies; and therefore it is not surprising to find that there was also a paper read by one of the members at the meeting, on "Municipal Trading from the Financial Standpoint." The author was Mr. S. S. Dawson, the Chairman of the Finance Committee of the Wallasey District Council, and Professor of Accounting at the Birmingham University; and, assuming the advisability of municipal trading, he submitted that the requirements of sound finance in this connection could be summarized somewhat as follows: (1) The capital invested in a municipal trading undertaking being raised by loans, the redemption of such debt, the provision for depreciation of assets, and the raising of reserve funds to provide for possible contingencies, should be arranged so as to adjust the position fairly as between present-day ratepayers and their successors. (2) The control of a municipal trading undertaking being in the hands of the representatives of the ratepayers, and ratepayers not being quite synonymous with consumers or users, the prices charged for the commodity, supply, or benefit (as the case may be), and the quality or extent thereof, should be such as will adjust the position fairly as between ratepayers and consumers or users in their respective capacities. They might, he thought, take it that, on the average at any rate, the period fixed for the redemption of a loan on a wasting asset was fairly commensurate with the life of the asset; and that in the case of lasting assets, the period of loan redemption was necessarily less than the life Under these circumstances, as between present and future ratepayers, they were not called upon to do anything further out of revenue than keep the undertaking in good repair and working order, keep down the annual interest on the loan, and provide the periodical instalments necessary to redeem the debt within the stipulated period—"such instalments being equivalent to depreciation in every sense of the term." A sum for contingencies, it was admitted, was obviously necessary; but the amount of this must depend upon, and vary with, the circumstances of each particular case.

Depreciation and Reserve.

Mr. Dawson went on to argue that, under existing regulations affecting municipal finance, either adequate depreciation fund contributions or the statutory sinking fund contributions, whichever be the greater, should be charged against revenue, in order to ascertain the true profit. There should, he contended, be a more careful consideration of circumstances affecting proposed loans than was afforded at present by either Parliament or the Government Departments. Local authorities should be given such a period within which the loans should be redeemed that it would involve such contributions to the sinking funds as might certainly be regarded as fully sufficient to protect the succeeding generation, "thus dismissing the discretionary question of depreciation from the province of each local authority, and bringing the voluntary provision of reserve funds within a comparatively small compass." Referring to the report of the Joint Select Committee on Municipal Trading issued some years back, Mr. Dawson pointed out that one of the recommendations was that the professional auditors whose appointment was contemplated should be required to express an opinion upon the necessity of reserve funds, the sums set aside to meet depreciation and obsolescence of plant, in addition to the contributions to the statutory sinking funds, and the adequacy of such amounts. While hoping that some day the recommendations of the Select Committee with regard to audit would be carried into effect, he also expressed the wish that at the same time some statutory guidance would be afforded to auditors on this important point. It would, he concluded, be of little use instituting "a uniform system of audit" if one of the dominant factors of the financial position was to be left dependent upon the personal opinion of a single individual however able, who had neither statutory precepts nor a united profession to assist him.

Thermal Conductivity of Fire-Clay.—The thermal conductivity of fire-clay has been investigated by Messrs. J. K. Clement and W. L. Egy at the Engineering Experiment Station of the University of Illinois, to obtain information concerning the loss of heat through the walls of boiler furnaces. A resistance coil was inserted in a fire-clay cylinder about 16 inches long and 4·8 inches diameter, provided with a hole about 1·4 inches diameter for the coil. Four small longitudinal holes were made for the insertion of thermocouples for measuring the temperature. The test cylinder was then inserted in a larger fire-clay cylinder, in order to maintain higher temperatures in the former, and obtain a more uniform radiation from it. The ends were covered to prevent any loss of heat there. The electrical apparatus was arranged so that a current could be kept constant within a variation of 0·1 ampere for several hours. Twelve cylinders were tested, embracing three varieties of fire-clay. The conductivity ranged from 0·00221 to 0·00362, averaging 0·00267.

Siphonic Action with Wells.—Siphonic action is the means by which water from 50 2½-inch driven wells of the Woburn (Mass.) supply is conveyed to the pit from which it is pumped into the the distribution system. The wells are connected to the pump pit by a 14-inch cast-iron pipe, which extends downwards almost to the bottom. The high point in the line where air may collect is tapped by two 2½-inch pipes, which are connected to a closed tank at the pumping-station. Air is exhausted from this tank and the pipe-line by a small vacuum pump operated by a water-wheel using ordinary town pressure, and siphonic action occurs, filling the pipe and tank with water. The air-pump is put out of action by a float regulator in the tank as the water rises in it. Air which accumulates during the operation of the siphon enters the tank, and consequently lowers the water level in it. The float therefore descends, and the air-pump is started automatically, exhausting the accumulated air. With this device practically no attendance is necessary. The cost of conveying the water by this method is about 12c. per day, according to the last annual report of Mr. W. H. Conway, the Commissioner of Water and Water Supply. It is said that the vacuum pump requires about 10,000 gallons of water daily, and that this is sufficient to draw from 1 to 1½ million gallons from the wells, if the ground water stands sufficiently above the level in the pump well.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 65.)

THE Stock Exchange has not had an entirely happy week. First, there was discontent at the persistent and intolerable stagnation of business; and next, the collapse of the American Railway Market under the Government thunderbolt launched against traffic rates. This engine assumed a less menacing aspect before the close; but it had already upset things a good deal. The opening day was dull and languid, and movements were mostly for the worse. Gilt-edged securities were weaker, and Consols fell $\frac{1}{8}$; but Home Rails were fairly firm. The tendency on Tuesday was quite as bad. Consols were unchanged, but Rails were weaker; the Foreign Market was heavy, and Americans shaky. Wednesday was not so gloomy, and one or two spots brightened up. Consols advanced $\frac{1}{8}$, Railways hardened, and even Americans were not quite so bad. Thursday was the worst of the week. The rout of American Rails caused much agitation; and its evil influence imparted great uneasiness elsewhere. Consols fell $\frac{1}{4}$, and Home Rails gave way, while most of the rest were worse. But on Friday calmer views prevailed, and a feeling of relief was promoted by some recovery in Americans; so that prices looked up a bit. The improved feeling lasted through Saturday; but Consols were put down on the announcement of a £4,000,000 Irish loan at what looked a cheap price. In the Money Market, there was a strong demand for the Stock Exchange settlement and for the half-year's end that kept rates up; but discount terms were easier. Business in the Gas Market was on a fair average scale; and the general tendency was good. There were not many changes in quotations excepting those caused by *ex div.* adjustments. In Gaslight and Coke issues, the ordinary was only moderately busy, but firm as a rock—all transactions being within the limits of $104\frac{1}{8}$ and $104\frac{3}{4}$. In the secured issues, the maximum realized 90, the preference $104\frac{1}{2}$ and $105\frac{1}{2}$, and the debenture 82 *cum div.* and $80\frac{1}{2}$ and $81\frac{1}{4}$ *ex div.* South Metropolitan was very quiet and firm, marking from 121 to 122. In Commercials, there were dealings in the 4 per cent. at from $107\frac{3}{4}$ to 109, and one in the $3\frac{1}{2}$ per cent. at $103\frac{1}{2}$. The debenture fetched 80 and $81\frac{1}{4}$ *ex div.* Among Suburban and Provincial, Alliance and Dublin changed hands at $81\frac{1}{8}$ (a fall of 1), Brentford old at $253\frac{3}{4}$, ditto new at $189\frac{1}{2}$, British at $44\frac{1}{4}$ and $44\frac{3}{8}$, and South Suburban at 122. On the local Exchange, Chester was done at $109\frac{1}{2}$, and Liverpool "A" at 220. In the Continental companies, Imperial was steady at from $178\frac{1}{2}$ to $179\frac{1}{2}$, ditto debenture realized $94\frac{1}{2}$ and $95\frac{1}{2}$, and Tuscan $9\frac{5}{16}$ and $9\frac{3}{8}$. Among the undertakings of the remoter world, Bombay was dealt in at $6\frac{5}{16}$, Cape Town mortgage at $49\frac{3}{4}$, Hong Kong at $17\frac{5}{16}$ and $17\frac{3}{8}$, Primitiva at from $7\frac{5}{16}$ to $7\frac{1}{2}$, ditto preference at from $5\frac{1}{4}$ to $5\frac{9}{16}$, ditto debenture at from $97\frac{1}{2}$ to $98\frac{1}{2}$, and San Paulo at $15\frac{5}{8}$ and $15\frac{3}{4}$.

ELECTRICITY SUPPLY MEMORANDA.

The Indirect Financial Disadvantages—Poor Commercial Abilities of Municipal Electrical Engineers—Municipal Combination for Securing Electrical Powers—As Others See Us, and We Them.

IN several towns in which the electric supply is run by municipalities, the ratepayers have learned to their cost that such possession and management have their disadvantages. Rates in aid and heavier bills for public lighting have largely accompanied this form of municipal speculation. But there are other ways in which the ratepayers have suffered injury, which perhaps are not so obvious, but are nevertheless existent. It is one of the illogical claims of municipal adventurers that, although municipal ownership of the electric supply has caused direct burdens to fall upon the ratepayers, there have to be set against this the reductions in the price of gas that competition has forced. Such claims sliding-scale gas companies can afford to treat good-humouredly, knowing full well that, without any electrical competition, the incentive to reduce prices is quite sufficient; seeing that, only by reduction of price, can increased dividends be paid to the shareholders. And it is a well-recognized fact that the lower the price of gas, the greater, under normal conditions, is the tendency to increased consumption; and the greater the output, the lower the productive and distributing costs, per unit of gas sold, under circumstances ruling at the time. Moreover, the whole development of the process of gas manufacture has been to bring about productive economy, resulting in lower charges to consumers. That there are companies who are in a position now to sell, because they produce, from 1000 to 2000 cubic feet of gas more per ton of coal carbonized than they did formerly, is not by any means due to electrical competition. But this increased production means an ability to sell at a lower cost than would be the case if the development in manufacturing economy had not taken place. If there had not been rate-aided competition, and withdrawal of the public lighting from the gas company (causing a smaller demand for gas than would otherwise have been the case), and if there had not been heavier payments through the rates in support of the municipal electricity concern, gas could have been, and would have been by sliding-scale gas companies, supplied at a still lower price than the present. That would have been a decided gain to the community. Both it and the costs inflicted upon the ratepayers by the electricity concern are, however, losses to the community. Besides, seeing that gas making and distribution employ more labour proportionately than electricity, the extent to which electricity has prevented the development of gas supply has been derogatory to the wage-earning power of the working classes. These considerations clearly show that municipal speculation in electricity supply has had its indirect, as well as its direct, financial disadvantages.

The contributor of Electrical Notes in "The Times Engineering Supplement" does not think much of the commercial abilities of the part of the electrical profession in municipal service; and his remarks on the subject draw from the background of our memory criticism that has been passed here on the financial failure of their work and endeavours. But if the charge is true as to the mediocre character of the commercial abilities of these professionals, it is not from want of much talking and writing; and some of it has been rather bizarre in character, as has often been disclosed in the "Memoranda." Only last week we were pointing to some examples of grotesque thought on commercial subjects, extracted from certain papers read before the Incorporated Municipal Electrical Association at Glasgow. And it seems that the same papers have provoked "The Times" writer to speak his mind. He alludes especially to the paper by Mr. A. C. Cramb, of Croydon, on "Commercial Advancement of Electric Supply;" and he hits hard when he says that there is a good deal of vague generality about Mr. Cramb's remarks on the subject, and that, as usual, it is easier to discuss the diagnosis than the treatment. It may seem daring to indict a whole electrical profession; but the writer in our contemporary asks, What use is there in disguising the fact that the members of the Municipal Electrical Association, in conference assembled, represent a body of men who have not succeeded in the vigorous commercial exploitation of electric supply, and have not succeeded for the best of all reasons—viz., that they do not possess the right qualifications? As station engineers, they have acquitted themselves ably; but, says their critic, they are not tradesmen, nor are they really fitted even to discuss among themselves the arts of the pushing tradesmen, as they may or may not be applied to electric supply.

The easy contempt of this engineering writer for the commercial abilities of municipal station engineers, makes his criticism, however true it may be, read a little caustic, though he goes on to show that the blame cannot be entirely put upon the backs of these much harassed officials. He tells his readers that the strength of gas competition mainly arises from the money power of the gas industry; we claim also that it arises from practical commercial ability. He fails also to perceive how at the moment electric supply can get on level terms with the gas industry in regard, for example, to the cheap hiring of apparatus. The fact of the matter is that the electricity industry is handicapped in not having as cheap and efficient apparatus as the gas industry; and the very nature of all that is required to produce useful effects from electric energy debars equality in simplicity and in low cost. And as to efficiency—well, that is a subject which we can afford to let pass. The criticism of the contributor to "The Times" stands in strange contrast to the fantastic statements (noticed last week) of the Electrical Engineer of Newport (Mon.), as to the gas industry being effete and moribund. Mr. Collings Bishop, the gentleman in question, is probably at home again sitting in his office armchair, simply watching, now that gas competition is practically dead, the wave of business rolling into his department. Why worry about commercial ability on the part of the station engineer, or about the employment of sales and advertising managers? Commercial ability, and sales and advertising managers, are not required for merely opening ledger accounts with consumers all too willing to light, heat, and cook by means electrical. There is clearly something for our electrical friends to do in adjusting the statements of Mr. Bishop and the Engineering Correspondent of "The Times."

According to municipal dictum, it is decidedly wrong of certain gas companies to enter into any combination to secure the "Metropolitan" No. 2 burner as a standard for testing purposes. Combination of the kind, municipally regarded, is against parliamentary usage, and is a means of procuring legislative powers that are inimical to the interests of the public collectively and individually. It is, in short, an evil creation of ingenious gas companies that deserves to be trodden under foot, and be put an end to once and for all. The authorities who rule parliamentary procedure do not share these views. They are not convinced that it is any part of the duty of the Legislature to place any obstacle in the way of legislative economy. But municipal belief in its own great virtues, and disbelief in the commonsense views on this subject of the Legislature, led to the matter being put to the test the other day with ill-success, on the second reading of the Standard Burner Bills. Before this took place, the members of the Municipal Electrical Association, in conference in Glasgow, were considering whether some special concerted effort should not be made to extend, to all municipal undertakings identified with the Association, the power of supplying wiring, fittings, &c. After some discussion, a resolution was passed to the effect that subscriptions be invited from all municipalities, whether members of the Association or not, towards a fund in support of a Bill which would extend wiring powers to all municipalities. There are a good many people (electrical contractors among the number) who are opposed to any extension of municipal trading powers, and to any municipal competition with private local traders. Such a jointly promoted Bill for wiring and fittings powers would be opposed to

certain public and individual interests. And therefore, it would be interesting to hear from Liverpool and the other municipal authorities who were agitating over the combination of gas companies in connection with the Standard Burner Bills what they think of this municipal proposition for promoting legislation.

In the "Memoranda" for June 21, there appeared a few comments on an article, with a particularly historic flavour about it, on "Street Lighting: Electricity *v.* Gas," published by the "Electrical Review." We showed how completely, in this question of competition, our contemporary—whether deliberately or unwittingly—was living in the past. Either way, there is no excuse for not being up-to-date in the advances of gas lighting. However, our contemporary has not, up to the present, seen fit to reply to any of the points raised in the comments. Subsequent to the penning of these, another article on the subject appeared, which need not be noticed save one paragraph. In this we are told: "The gas interests are fighting hard in their last ditch; and the instances we refer to in the present article show how necessary it is for all engaged in the electricity supply industry to adopt the most active publicity methods in order to counteract their wiles." The "Electrical Review" is, it is patent, suffering from the same form of hyperbolism as Mr. Collings Bishop. "The gas interests are fighting hard in their last ditch;" and yet the electricity supply industry must "adopt the most active publicity methods in order to counteract their wiles." What a bloodthirsty old "Electrical Review" this is that advises such active measures against men struggling for existence in the last ditch. But talking of "wiles," those of the gas interests are nothing compared with those of the electrical interests in trying to make the public believe that certain things are different from what they actually are; and it behoves the gas interests to see that this sort of thing is met by "most active publicity methods."

For example, looking through "The Times," "Daily Telegraph," and other papers on Wednesday, we see a column advertisement article headed "The Lighting Problem—Gas *v.* Electricity—A Comparison of Cost—Important Tests." There is not, however, a single comparison of cost between gas and electricity in the article. Is it honest, or is it gross deception, to adopt a heading such as that quoted under the circumstances? The only statement—the only dogmatic assertion we can find referring to gas in the article is that, "with the advent of metallic lamps, it is now cheaper to 'burn' electricity than gas." But the article goes on to allude to comparisons between electric carbon filament and metallic filament lamps—not between gas and metallic filaments. And if the authors of the article, who appear to be the makers of the "British Metalite" lamp, are speaking truthfully, there has been a good deal of hoodwinking of the public going on over the metallic filament lamp business; for of the metallic filament lamps tested, there was only one—and that the "Metalite"—that did not grow quickly dimmer with use, with concurrently an increase in electricity consumption. Now this does not speak well for the claims and statements freely advertised by the electrical people. But we notice that these particular advertisers, so as to make the hours of use look long on an expenditure of 1d. for electricity, merely take a 10-candle power lamp, and electricity at the rare low price of 3d. per unit. Some of the lamps only ran for sixteen hours for 1d.; others for twenty-six; but one—oh! the glory of it!—ran for thirty-two hours. Needless to say, that was the "Metalite" lamp. This only represents 1 watt per candle power! Well now with gas at 2s. 6d., 33 cubic feet can be purchased for 1d.; and this will run an inverted lamp, giving 20-25 candles, for 33 hours. So that on the 10-candle basis, the pennyworth of gas would represent at least 66 hours' similar illumination for 1d. "The most active publicity methods" are required to counteract such "wiles."

Next day another column advertisement article appeared, in which were a few very strange and somewhat contradictory statements. Consider this: "The cost of 'burning' electricity has been so much reduced through metallic lamps that a great many people find that it is now cheaper to use it for lighting than gas." And this: "With a great many people, the question of *economy has to be primarily considered*, and, *for that reason alone*, they have continued to use gas." What we gather from this is that modern incandescent gas lighting is more economical than electric lighting, even with the "Metalite" lamp; and that economy is what most people have to primarily consider. Yet there are certain people who, for some inscrutable reason, or reasons, find it is cheaper to use electric lighting. We would venture to suggest as possible reasons antiquated burners, and a barbarous waste of gas. Then we get a whole page advertisement in the "Daily Mail" booming "the wonderful Watkin switch," whereby electric lamps can be varied between "full on," "dim," and "off." Some of them are dim enough without the Watkin switch. But that is not the point. It is that by the use of the invention and by those who can afford from 17s. 6d. to 35s. per switch, "the full benefit of metallic filament lamps can be had, and the cost further reduced; thereby rendering gas an antiquated and expensive means of lighting, heating, &c." "The most active publicity methods" are needed, "in order to counteract the wiles" of these electrical people. The "Electrical Review" is thanked for the hint.

The Accession of the King, who as Prince of Wales presided over the Royal Society of Arts after King Edward came to the Throne, and subsequently became a patron of the Society, caused a vacancy in the presidency, which has been filled by the election of Lord Alverstone, the Lord Chief Justice of England.

PERSONAL.

Mr. R. Hesketh Jones has resigned the chairmanship of the Oriental Gas Company, Limited, and Mr. H. D. Ellis, the Deputy-Chairman, succeeds him in the position. Mr. Hesketh Jones was elected Chairman in November, 1900, on the death of Mr. John Blacket Gill, who was also Chairman of the European and Commercial Gas Companies.

At the last meeting of the Co-Partnership Committee of the South Metropolitan Gas Company, Mr. Charles Carpenter, the Chairman of the Company, who presided, offered, on behalf of the Committee, a cordial welcome back to Mr. Joseph Tysoe, the Engineer-in-Charge of the East Greenwich Station, from his sojourn abroad, and said all were glad to learn that his enforced absence of some months had resulted in his regaining good health once more. Mr. Tysoe, it may be remembered, acting under medical advice, left England for Egypt early in February last to shake off some troublesome symptoms which had presented themselves.

A pleasing ceremony took place last Wednesday morning, when Mr. John Fazakerley was made the recipient of a fumed oak *secrétaire*, suitably inscribed, as a token of esteem from the officials and workmen of the Whitwood Chemical Company, Limited, of Normanton, on severing his official connection with the Company after twenty years' service. The meeting was presided over by Mr. W. Ackroyd Bower, the Engineer and General Manager, who expressed his regret at losing the services of Mr. Fazakerley, but at the same time congratulated him upon his new appointment as Gas and Water Engineer and Manager to the Goole Urban District Council, and wished him every success. He then called upon the Secretary (Mr. W. Bourne), as being the oldest official of the Company, to make the presentation. In doing so, Mr. Bourne fully endorsed the remarks made by the Chairman. Mr. Fazakerley, in accepting the present, spoke of the uniform kindness he had received during the whole of the time he had been connected with the Company. Mrs. Fazakerley was presented with a silver flower-vase.

Mr. A. Morton Fyffe, who is leaving Dundee in the course of the next few days, to become Gas Engineer and Manager at Nelson, was the guest at a complimentary dinner in the Royal Hotel last Tuesday. The company, which was very representative, numbered about fifty, and was presided over by Mr. Alexander Yuill, the Engineer of the Dundee Gas-Works. The toast of "Our Guest" was submitted by the Chairman. Mr. Fyffe, he said, was a true Dundonian. He served his apprenticeship as an engineer in the Burgh Engineer's office, and for seven years had been connected with the Gas Department. He had done splendid work at the gas-works in connection with the reconstruction scheme; and he (Mr. Yuill) had a high appreciation of his ability, not only as an engineer, but for the inventive genius he brought to bear on all problems or work that required concentration of thought and professional ability. The Chairman, in closing, said they all hoped he would have much health and happiness in his new sphere in Lancashire. Mr. Fyffe, in his reply, said he was proud of the fact that he was a native of Dundee; and it was a great joy to him, on leaving it, that he took with him the good wishes and kindly thoughts of many of his friends. Returning thanks to Mr. Yuill for all he had done for him, he said that gentleman had taught him engineering and humanity; and he confessed that it was on the shoulders of Mr. Yuill's success that he had attained to the position he now occupied. He would look back upon the night as a beacon, lighted to have him remember that the eyes of his friends were on him, that they expected well of him, that he would do his level-best, and that he would go "dead-straight." He meant to try. Mr. Fyffe has been made the recipient of several parting gifts from the employees at the gas-works and friends; these including a silver-fitted dressing-case, and a leather suit-case.

NOTES FROM WESTMINSTER.

The Standard Burner Bills.

The Standard Burner Bills entered upon their final stage yesterday; so that we shall soon know their fate. They have been included in Group F, and were first down to come before the Committee on Thursday of last week. But some Local Government Board Provisional Orders Bills had precedence, and so the date was altered to yesterday. It is noticed that the Wolverhampton Corporation have withdrawn their petition against the No. 3 Bill; but nevertheless the representatives of the Gas Company were present yesterday.

Over the Committee who are considering the Bills, Sir Henry Kimber is presiding; but yesterday morning one conscientious member—Mr. H. C. Mallaby-Deeley, the Member for Harrow—retired, owing to the fact that he is a shareholder in the Gas Company operating in his constituency, and that Company is interested in the present Bills. The promoters and the opponents have the same representation—legal and expert—as when the Bills were

before the Upper House; but in regard to the Bills themselves it has been decided to leave the Liverpool Gas Company out of No. 1 Bill, and give them the honour of a separate Bill, seeing that high-candle power gas invests their case with a special condition, which is thought by the opponents to require special discussion. But the principle of an unconditional change of test-burner (which has been settled by numerous precedents) is being fought all over again on the three Bills. It is a wearisome business this repeated tramping over the same ground. Mr. Fitzgerald, K.C., opened for the Bill yesterday morning; and the first witness was Mr. Charles Carpenter. His cross-examination by Mr. Ram, K.C., was the feature of the afternoon; and Mr. Ram found that he had rather a tough nut to crack. On all his main points there was an answer. With the merry assurance of a lawyer who thinks he has cornered his witness, the learned Counsel got Mr. Carpenter on to the question of the availability to gas consumers of the "Metropolitan" No. 2 burner from the cost point of view; and Mr. Carpenter produced a letter from a Birmingham firm, offering to make 10,000 burners at 102s. per gross net, or about 9d. each, to which would have to be added 2d. or 3d. apiece, in the first instance, for the dies, and something for the retailers' profit. If there were a demand for the burner (which there would not be in view of the incandescent burner), and 100,000 were ordered, the price would be still lower. Then Mr. Ram essayed to draw from Mr. Carpenter that the South Metropolitan Gas Company made a concession in price on having the "Metropolitan" No. 2 burner applied to them. That is a common mistake. And again learned Counsel learned—no doubt much to his disgust—that the concession applied to the reduction of the illuminating standard from 16 to 14 candles, and that the change from the No. 1 to the No. 2 burner did not take place until some four years later. Only in the case of the Brighton Bill, has there been any direct reduction of standard price owing to the change of standard burner, and then the Committee said the reduction was "mainly" due to that change, so that other considerations applied. Any other reduction of standard price in consequence of the adoption of the new burner has been by arrangement between the parties. Professor Vivian B. Lewes goes into the chair this morning.

Capital Redemption and Other Matters.

Not satisfied with what they obtained in the House of Commons, the Brighton and Hove Corporations have appeared in opposition to the Brighton and Hove Gas Bill before the Duke of Bedford's Committee, wasting (as was expected) time and money, and getting nothing. The result sizes-up very fittingly the character of their action—more especially that of the Brighton Corporation. It will be remembered that, among other things, the Company sought a capital redemption fund; and, as the measure left the Commons, and as it stands now, there is provision for a fund totalling to £57,000, whereby, by appropriations not exceeding £1800 each half year from revenue, capital to that amount is to be wiped out. Then the power ceases. The unproductive capital represents the abandoned Black Rock and Hove gas and residuals manufacturing plant. The Corporations were in a sort of quandary over the matter. They could not deny that the wiping out of unproductive capital is a financially sound and economic procedure; but the Brighton Corporation had the boldness to contend that such liquidation of dead-capital would be of no advantage to the consumers. It is distinctly to their disadvantage to perpetually pay dividends on unproductive capital. But what the Brighton Corporation seemed desirous of doing was to shift the responsibility of clearing off this capital to the successors of the present generation of consumers, and to let the present generation enjoy the reductions in price that would come to them from the money that would otherwise be employed to discharge the unfertile capital. But to the present consumers, as time advances, redemption of that capital must be more advantageous than continuing its existence. The Brighton Corporation seemed to have some floating notion that the proprietors would benefit more from the carrying out of the proposition than the consumers; but in what way their ideas were the most hazy. No doubt the Corporation had an eye to the Company being assisted, through the operation of the fund, to even a somewhat better competitive position than now; and this naturally, as electricity suppliers, they do not want. The Hove Corporation, in their wisdom, agreed it was prudent that dead-capital should be redeemed; but—and there's the rub—in their judgment the shareholders should provide the money for the purpose. Mr. Charles Carpenter put the position tersely from the shareholders' standpoint, when he said it would be unfair to compel them to provide the capital twice over; and the Committee thought so to, for they declined to touch the redemption clause.

Road Openings and Public Lamp Consumption.

The County Council succeeded in getting modified the general law regarding the three days' notice of the breaking-up of streets for pipe and other work. They unreasonably asked for a month's notice; and the Committee gave them a fortnight. But this only applies to 5 miles of roads, out of a total of 192 miles in the Brighton Company's area. At the same time, the fortnight is too long for general practical application. Another point of interest is that the agreement between the Brighton Corporation and the Gas Company provides for the supply of 4 cubic feet of gas per hour to each street lamp. The Corporation wanted to get parliamentary authorization for the revision of the terms, and the use of only 3 cubic feet per hour. But the street-lamp burners are all arranged for a consumption of 4 cubic feet; and the Company strongly objected to any reduction of consumption that would produce a flame that would not properly fill the mantles, and so bring the public gas lighting into unfavourable contrast with the Corporation electricity supply. The Committee were against the Corporation in the matter; and so, as we last week predicted was likely to be the case, this second appearance in Parliament on their part has been fruitless and wasteful. The witnesses called in support of the Bill were Mr. A. M. Paddon (Chairman of the Company), Mr. E. L. Burton (the Secretary), Mr. Joseph Cash (Engineer), Mr. E. Herbert Stevenson, and Mr. Charles Carpenter.

Glasgow Gas Charges and Discounts.

The Glasgow Corporation deserve their Gas Consolidation Bill; for they have accepted unreservedly the policy of no rate aid from profits, and in respect of other matters have thrown themselves largely upon the judgment of Parliament. The past week has seen a rare fight over the Bill before the Duke of Bedford's Committee. It lasted the whole parliamentary week; and throughout the Corporation of Glasgow were largely in the position of interested spectators watching the struggles for advantage of one kind or another among those who were arrayed only nominally as opponents of the measure—moving merely to act upon the defensive when the interests of the city proper and of the gas undertaking and the consumers were in any way menaced, and carrying the fight a little further on one or two special points. Big and litttle interests were assembled there seeking the benevolent consideration of their Lordships from their special point of view; and, consequently, there was one of the largest shows of Parliamentary Counsel that has been seen in one room at one time for many a day. On the main questions, the Corporation were content with the Bill as amended in the Commons, and as it came before their Lordships, with, if agreeable to the latter, a few minor modifications. But at the same time they were not averse, if the opponents succeeded in proving to the Committee the wisdom of so doing, to having re-established some of the provisions contained in the original Bill, before the Commons Committee defaced it—in certain respects for the better. There were opponents who wanted changes; and there were "opponents" who wanted the Bill to pass just as it came before their Lordships. This was an extremely interesting state of things, and not one that is often found in the Committee rooms. The preamble of the Bill was not opposed; and virtually the Committee were merely, on several points, arbitrators between those who were seeking concessions. The main issue of the wordy warfare of the week is that the Committee have expressly confirmed the decision of the Lower House that no profits are to be taken in aid of the rates. But in certain other respects, the Gas Department have obtained a little relaxation in the terms that were put upon it in the Lower House.

In addition to the prohibition as to profits being transferred in aid of rates, the Commons Committee provided for equality of price, or flat-rates, throughout the area of supply (other than in a district known as the supplementary supply district), for various purposes; and in the supplementary area, they allowed a higher price by a maximum of 50 per cent. than is charged for the various purposes in the city area. A level discount of only 5 per cent. was granted for prompt payment for any class of business. Trading in water-tight compartments of this kind is not good for the traders. The Corporation and the Gas Department realized this; and therefore there was a friendly feeling towards those opposing manufacturers and traders who come along asking that there should be discounts allowed according to the class and volume of business. Over this matter, and over the attempt of the authorities in the supplementary district to get reduced the 50 per cent. maximum difference, the bulk of the evidence roamed. The supplementary district did not succeed in securing the favourable consideration of the Committee; and the 50 per cent. remains. All the well-worn and commonsense arguments favourable to a free hand, under like circumstances, in dealing with large consumers of gas—liberty wanted never so much as to-day—were placed before their Lordships, who showed a commercial appreciation of the matter by opening the door to differential prices in this manner: The price to be charged by meter is to be at all times charged equally, under like circumstances, to all consumers within the city supply district; the Corporation may supply gas for heating, cooking, motive power, warming, ventilating, for the various requirements of trade, &c., provided that the rate charged for the gas supplied is the same under like circumstances to all persons. The 10 and 15 per cent. discounts clause respectively for prompt payment and large consumption is inserted. The Committee have also allowed the creation of a reserve fund by accumulations of annual sums not exceeding ½ per cent. on the amount of the outstanding borrowed money until the fund is equal to 10 per cent. of the money outstanding, when any subsequent excess will be carried to revenue. In addition to the Convener of the Glasgow Corporation Gas Committee (Mr. M. W. Montgomery), the witnesses included Mr. Alex. Wilson, Mr. Corbet Woodall, Mr. W. Doig Gibb, Mr. W. R. Herring, Mr. H. E. Jones, and Mr. E. H. Stevenson. And all these were favourable to the Gas Department being given more business latitude than was possessed as the Bill left the House of Commons. With their Lordships' decision, Mr. Wilson mentioned to our representative yesterday, the Glasgow Corporation are thoroughly well pleased. They did not care so much about the surplus profits as about the freedom in price.

GAS ENGINEERING AND SUPPLY EXAMINATIONS.

A Further List of Successful Students.

In response to the invitation extended in our editorial columns last week to successful candidates in the last Gas Engineering and Supply Examinations to send in their names, we have received the following, in addition to those given on pp. 776 and 934.

GAS ENGINEERING.

Honours Grade, First Class.

Atley, W. Walker	Whitwood Chemical Works.
Bullen, A. E.	Plymouth.
Carmichael, Thomas	Barrhead.
Coombs, Harold A.	Cheltenham.
Jones, Harold	Stourbridge.
Myers, Ernest	Chesterfield.
Rudge, C. A.	Whitwood Chemical Works.
Williams, Samuel J. D.	Stourbridge.

Honours Grade, Second Class.

Bartlett, Oliver J.	Bromley-by-Bow.
Millen, R.	Whitwood Chemical Works.

Ordinary Grade, First Class.

Priest, F.	South Metropolitan Gas Company.

Ordinary Grade, Second Class.

Henn, Karl	Dudley.

GAS SUPPLY.

Honours Grade, First Class.

Briggs, F. C.	Bromley-by-Bow.
Twist, George	Doncaster.

Honours Grade, Second Class.

Bullen, A. E.	Plymouth.
Chandler, S. B.	South Metropolitan Gas Company.
Helden, R. E.	South Metropolitan Gas Company.
Highmore, J. G.	South Metropolitan Gas Company.
Noon, E. H.	South Metropolitan Gas Company.
Williams, Samuel J. D.	Stourbridge.

Ordinary Grade, First Class.

Bridgeland, A. H.	South Metropolitan Gas Company.
Forbes, E.	Glasgow.
Kay, Archibald	Glasgow.
Reed, W. B.	South Metropolitan Gas Company.
Sinclair, Robert E.	Glasgow.

Ordinary Grade, Second Class.

Aitken, Moses N.	Glasgow.
Bradford, —	South Metropolitan Gas Company.
Coggin, H.	South Metropolitan Gas Company.
Cooper, John A. R.	Fraserburgh.
Dolan, William	Glasgow.
Henn, Karl	Dudley.
Seyssert, —	South Metropolitan Gas Company.
Steele, William	Glasgow.
Strathearn, James	Glasgow.
White, James	Glasgow.
Wilson, Thomas J.	Glasgow.

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the ensuing session, containing the regulations for the examination of candidates in technological subjects. As usual, examinations will be held in the two subjects of "Gas Engineering" and "Gas Supply;" and intending candidates will find on pp. 49-54 an indication of the nature of the questions which will be set by the Examiners (Mr. Thomas Glover and Mr. J. H. Brearley) in the Honours and Ordinary Grades, and a list of the books they are recommended to consult. The examinations will be held on the 29th of April and the 6th of May next. The first prize in the Honours Grade is £3, given by the Goldsmiths' Company, and the Institute's silver medal; the first and second prizes in the Ordinary Grade being £2 and £1 10s., given by the Company (in each case accompanied by the Institute's bronze medal); and the third a bronze medal. The examinations in "Coal-Tar Distillation and Coal-Tar Products" will be held on the 4th of May; the Examiner being Dr. J. C. Cain. The new syllabus is under revision, and will be issued separately. It will be divided into two distinct sections, dealing respectively with tar distillation and immediate products, and coal-tar colouring matters. The programme, published by Mr. John Murray, Albemarle Street, costs 9d. net.

Some changes in the staff of the Chemical and Gas-Testing Department of the London County Council, consequent on the retirement of Mr. W. J. Livingston, a chemical assistant who also acted as chief clerk in the department, have now been sanctioned. It was decided, on the recommendation of the Establishment Committee, to promote Mr. E. R. Andrews, a chemical assistant of the first class, to be senior assistant; to appoint Mr. W. E. F. Powney, a second-class assistant, to fill the vacancy thus created; and to bring up into the second class one of the assistants of the minor establishment, as from the 1st inst. These changes will effect a saving of £271 in the current financial year, and an ultimate annual saving of £146.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

The Forty-Sixth Annual Report of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued yesterday. It is signed by Mr. R. Forbes Carpenter, who, at the end, expresses regret that continued ill-health precluded his doing more than generally supervise its preparation, the work in connection with which was carried out by his Assistant, Mr. S. E. Linder, B.Sc. It contains, as usual, various matters of special interest to our readers; but to-day we can only give an indication of the contents of the report, leaving for subsequent issues a fuller notice of it, as well as of the reports of the District Inspectors. As our readers are aware, Mr. Carpenter has now retired, and Mr. W. S. Curphey, who for some years had entire charge of the work in Scotland, has been appointed Chief Inspector.

The report opens with the statement that the number of works registered on Dec. 31, 1909, was 1263. Of these, 71 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder—1192—carried on processes which were scheduled or subject to registration under the Act of 1906. These numbers show a decrease of one alkali works, and an increase of three scheduled and registered works, compared with 1908; the net increase being two. There are also 169 works registered in Scotland; bringing up to 1432 the total number of works registered in the United Kingdom. The number of separate scheduled and registered processes under inspection last year was 1857, compared with 1839 and 1821 in the two preceding years. There is again a noticeable increase in the number of works manufacturing sulphate and muriate of ammonia; these, with gas-liquor works, accounting for more than 31 per cent. of the processes under inspection. The Inspectors paid 5600 visits to works, and carried out 6252 tests, compared with 4860 visits and 5170 tests in 1908. It is satisfactory to find that no proceedings had to be taken against the owners of registered works for infraction of any of the penal clauses of the Act. But in the case of three works, serious warnings had to be given; and proceedings were only withheld on the owners undertaking to remedy the structural defects which led to the escape of noxious and offensive gases.

Sulphate of Ammonia and Gas-Liquor Works.

Mr. Carpenter reports that the total number of processes of this class now under inspection is 591—an increase of 13 on the year 1908. In the report for his district, Dr. Fryer records a serious occurrence—happily unattended with fatal results—that took place with the sulphate of ammonia plant at one works. It appears that two men were gassed while engaged in cleaning a seal in the foul-gas main in the lime-settling tank, which is placed under the cold-water condenser, and receives condensed liquor from a syphon placed on the foul-gas main just before it enters the purifiers. Samples of the liquors from the seal-pot and the syphon, taken at a later date, were examined in the Chief Inspector's laboratory, and found to contain sulphuretted hydrogen, carbon dioxide, and hydrocyanic acid; the syphon liquor containing cyanide equivalent to 0·415 gramme of hydrocyanic acid per 100 c.c. Mr. Carpenter says it is important that manufacturers should not overlook the presence of this extremely poisonous constituent of the foul gases evolved on distillation of gas liquor; and attention has been directed to the point in previous reports. It is desirable, also, to emphasize the fact that the specific gravity of such gases when cold much exceeds that of air, and that when a seal is broken at a low level, the gaseous content of the system will tend to empty itself downwards—air entering at any opening in the upper part of the system to take the place of the foul gases so displaced.

During the latter part of the year, plant was erected and put into operation at a gas-works for the elimination of sulphuretted hydrogen from crude coal gas and the recovery of the sulphur as a bye-product according to the patent specification of Herr Walther Feld. Mr. Carpenter gives an outline of the process, which, he says, is still somewhat in the experimental stage; and therefore it is too early to pronounce any opinion as to the efficiency of the plant for the purpose named, or the extent to which such plant would be applicable for the removal of sulphuretted hydrogen in other gaseous mixtures than that named above. Herr Feld has since developed a method for the simultaneous extraction of ammonia and sulphuretted hydrogen based upon principles similar to those applied in the method for the elimination of sulphuretted hydrogen alone; the active reagents being ferrous sulphate, thiosulphate, and thionates. Mr. Carpenter says the development of Herr Feld's processes will be awaited with interest. These remarks are followed by a further memorandum by Mr. Linder on the results of his analysis of ammoniacal liquors.

Recovery and Production of Ammonia.

Mr. Carpenter gives his customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. The figures are on the next page.

These figures show an increase from all sources of supply with the exception of that from gas-works; the increase in the produce

—	1909.	1908.	1907.
Gas-works	164,276	165,218	165,474
Iron-works	20,228	18,131	21,024
Shale-works	57,048	53,628	51,338
Coke-oven works	82,886	64,227	53,572
Producer-gas and carbonizing works (bone and coal) . .	24,705	24,024	21,873
Total	349,143	325,228	313,281

from coke-ovens being very marked—viz., more than 18,000 tons. Operations on the large scale in Ireland for the recovery of ammonia from peat are still in the experimental stage.

Difficulties continue to be experienced with river authorities having jurisdiction in the districts where coke-oven recovery plants are situated; the presence of sulphocyanides and phenoloid bodies in the effluent from such works causing much apprehension in the minds of those responsible for safeguarding the condition of the river courses receiving the drainage therefrom. The subject received extended notice in the report for 1907, where attention was drawn to the experiments of Professor Percy F. Frankland and Mr. H. Silvester on the bacterial treatment of spent ammoniacal liquors, and of Dr. Gilbert Fowler's work on the same subject at the Bradford Road residual works of the Manchester Corporation. Some designers of plant are now directing their attention to the recovery of the ammonia produced at coke-oven recovery works by direct methods designed to obviate the need of discharging effluent liquors of the character now complained of; and it is possible a solution of the difficulty may be found on these lines.

Further Studies in Coal Carbonizing.

At the conclusion of the experimental work described in the report for 1908, it was seen that continuance of the work on the lines laid down in that research would be impossible, accompanied, as each experiment had to be, by gas analysis of a very laborious character. During the past year, however, it was felt that some effort should be made to continue the research, when opportunity offered, on a less ambitious scale, with the view, if possible, of clearing up some of the many problems left unsolved at the conclusion of the work in 1908, more especially those relating to the yield of hydrocyanic acid at different temperatures and varying rates of flow. It seemed desirable to confine attention entirely to the reactions taking place in presence of wood charcoal and graphitic carbon, and to exclude porcelain altogether from consideration, as the results obtained in 1908 clearly proved that, at temperatures exceeding 800° C., porcelain has a strong oxidizing effect on hydrocarbons, ammonia, and hydrocyanic acid. But, on endeavouring to repeat some of the results obtained in 1908 with wood charcoal, it was found that the material could not always be relied upon to yield the same results under the same conditions of temperature, rate of flow, and volume and composition of reacting mixture; in fact, that the efficiency of the contact-material itself was subject to variation. The cause of this variation is obscure; but Mr. Carpenter says there is reason to connect it with the fact that hydrocarbons and hydrocyanic acid are more or less unstable in contact with carbon at high temperatures. Under such conditions, carbon of possibly graphitic character is deposited on the surface and within the pores of the contact-material, and very considerably modifies its character. It was further found that after continued treatment with coal gas (freed from illuminants) and ammonia, the wood charcoal became uniformly coated throughout its substance, and that the catalytic power attained a value sufficiently constant to justify the use of the material for the purpose of determining the comparative effect of varying temperature and other factors under controlled conditions.

The wood charcoal was prepared for use in the comparative experiments by continuing the treatment with ammonia and coal gas under the same conditions until approximately constant results were obtained. The temperature or rate of flow was then altered, and a series of results obtained. Conditions were finally restored, and the original experiment repeated. Agreement between the first and last experiments was considered to be proof that the contact material remained unchanged throughout the series. Full particulars are given of these experiments, and the more important conclusions arrived at are summarized as follows: (1) That the efficiency of wood charcoal in effecting the conversion of ammonia into hydrocyanic acid decreases with use. Such decrease is attributed to the deposition on the surface of the charcoal of graphitic or other form of carbon derived from hydrocarbons or hydrocyanic acid as a result of thermal decomposition. (2) That the hydrocyanic acid so obtained is the product of a reversible reaction controlled by temperature, and accompanied by secondary reactions yielding carbon, nitrogen, and hydrogen, by thermal decomposition of NH_3 and HCy. Thus—

$$NH_3 + C \rightleftharpoons HCN + H_2$$
$$2NH_3 = N_2 + 3H_2$$
$$2HCN = H_2 + 2C + N_2$$

(3) That, in the presence of wood charcoal coated with graphitic carbon, hydrocyanic acid possesses a high degree of stability up to a temperature of 1000° C.; and at 1100° C. thermal decomposition begins to be rapid. (4) That the presence of hydrocarbons, methane, and especially ethylene, is favourable, but not essential, to a high yield of hydrocyanic acid; ammonia acting directly on carbon to form hydrocyanic acid in presence of hydrogen alone as diluent.

As the work was approaching completion, attention was directed to the researches of Dr. G. A. Voerkelius on the formation of hydrocyanic acid from ammonia and wood charcoal, published in the "Chemiker Zeitung." Dr. Voerkelius, by independent research, and employing other apparatus and procedure, has arrived at conclusions similar to those stated above; and Mr. Carpenter says the two researches afford mutual support and confirmation.

Towards the close of the report, reference is made to the Glover-West system of vertical retorts at St. Helens, and to the results of Dr. Colman's tests made on different dates and with various coals. These have already been published in full in the "Journal." Mr. Carpenter remarks that Dr. Colman does not give any temperature data, and that it is not possible from his figures to determine the time spent by the coal gas in the retort. Mr. Thomas Holgate has estimated that for a horizontal retort (partially filled) the time of the gas in the retort (calculated for gas at 60° Fahr. and 30 inches atmospheric pressure) would be 2·7 minutes (= 162 seconds) at the start to 5·6 (336 seconds) at the end of the distillation; but such limits would not be applicable to a fully-charged vertical retort continuously generating gas. In the laboratory experiments on "Graphitic Scurf" recorded in the report for 1908, the time of gas in the tube (calculated for 60° Fahr. and 30 inches of the barometer) would be about 77 seconds. He adds that "further data are required before any conclusion can be safely drawn as to the connection existing between carbonization temperature and the relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort. In the works, further knowledge is needed of the distribution of temperature in the retort and of the relation of hydrocyanic acid to ammonia in the crude coal gas as it leaves the retort, and before condensation has taken place. In the laboratory, the work has to be extended to include experiments on ammoniacal mixtures down to 1 per cent.; and, further, to study the effect of the varying nature and amount of ash in the graphitic contact used. It may well be found that a high percentage of ash, and especially of ash containing iron compounds, is very detrimental to the survival of ammonia and hydrocyanic acid in the reacting gases."

OBITUARY.

The death is announced of Mr. Joseph Bickerton, one of the first Directors of the "National" Gas-Engine Company, of Ashton-under-Lyne. Deceased was in his 71st year.

The "Journal für Gasbeleuchtung" reports that the death occurred on the 23rd ult. of Herr Arnold Schreyer, the Manager of the Corporation Gas and Water Works at Halle in Saxony. Deceased was in his 61st year.

The death occurred last Tuesday, at the age of 75, of Mr. John Smith, the Consulting Gas Engineer of the Bangor (North Wales) Corporation. He had been connected with the gas undertaking for 36 years, and was formerly Gas Manager—a position he relinquished two years ago. Deceased was an able and conscientious servant of the Corporation.

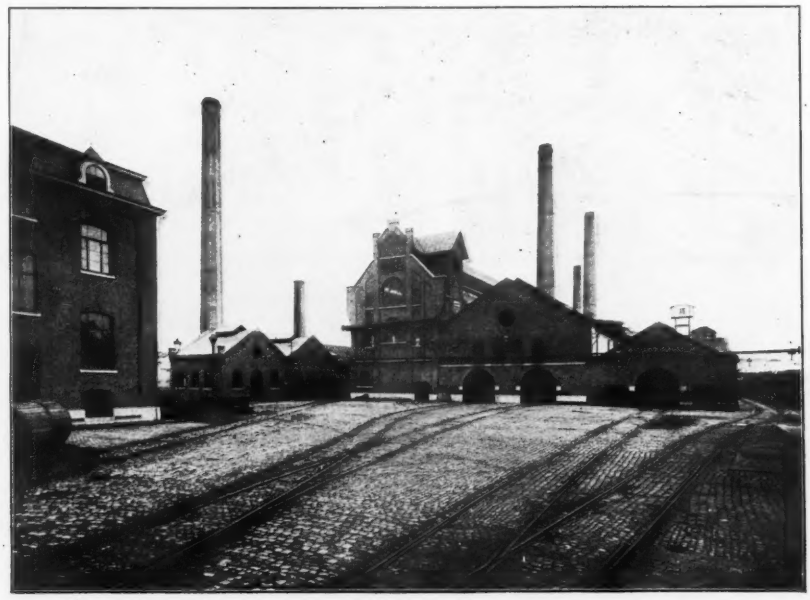
We regret to record the death last Sunday, at his residence, Woodthorpe Hall, Sheffield, in his 66th year, of Alderman Thomas Robert Gainsford, J.P., whose name will be remembered by many of our readers in connection with the water undertaking of the Sheffield Corporation. Though there had been signs for some little time of the breaking-up of his health, he was able to attend to his public duties almost till the last, having been engaged in them up to Thursday, the 30th ult. He was closely identified with the acquisition of the water-works by the Corporation in 1888, and was Chairman of the Water Committee till his retirement at the end of 1907, when the Council placed on record, in an address, their appreciation of his unremitting and devoted services to his native city in connection with its water supply. The address was illuminated, and presented to him the following June. Alderman Gainsford was also Chairman of the Derwent Valley Joint Water Board. He leaves a widow, two daughters, and three sons.

The Board of Agriculture and Fisheries announce that they have recently published a memoir of the Geological Survey on the water supply of Hampshire, including the Isle of Wight. It is the eighth of a series dealing with the water supply derived from underground sources. The introduction contains particulars of the geological formations of the county, with special reference to the water-bearing strata. Wells, borings, and springs, with supplies therefrom, intermittent streams, contamination of water, and analyses of various waters are also dealt with in the succeeding chapters. In addition, the memoir is accompanied by a rainfall map of the county, with explanatory report and statistics, and also a map of the valleys of the Test and Itchen, showing the position of wells and the contour lines in the surface of the underground water. A bibliography of works relating to the water supply of the county is included. Copies may be obtained from any agents for the sale of Ordnance Survey maps, or directly, or through any bookseller, from the Ordnance Survey Office, Southampton, at the price of 5s.

THE FOREST (BRUSSELS) GAS-WORKS.

In the account which appeared in the "JOURNAL" last week of the gathering of gas engineers in Brussels, it was mentioned that a visit was paid to the Forest works of the Imperial Continental Gas Association. In connection therewith, an interesting pamphlet had been prepared by Mr. H. Salomons, the Engineer; and from it some particulars were reproduced of the vertical retorts in use. We are now able to give, from the same source, a description of other portions of the works.

The Compagnie Continentale du Gaz hold concessions for the supply of gas in Brussels and its numerous environs. Of their two works, those at Forest are the more important, and have grown rapidly of late years, as shown by the area at present covered (6 hectares 41 ares) compared with that (2 hectares 58 ares) when the works were established in 1866. In 1867, they comprised a retort-house of 16 grate furnaces, producing 24,000 cubic metres of gas per 24 hours. The first condensation of the tar and ammoniacal liquor was done in 15-inch cast-iron mains, which led direct from the retorts round the whole of the retort-house and coal-stores. The gas then passed into the washers, separators, and lime purifiers, thence through a meter of 1133 cubic metres capacity to a gasholder of 5825 cubic metres capacity, of the two-lift type, in a concrete tank. The system of mains was of small extent relatively to the present one—176 kilometres compared with 475 kilometres on May 1. As regards the output of gas in 1867 and 1909, the latter, even without Brussels and St. Gilles, is three times that of the former. The consumption has progressed to an unanticipated extent; and in view of the increasing area of supply, the make must reach a still higher figure.



Entrance to the Works.

Comparing the condition of the works with that in 1892, a few changes are to be noted. The retort-house has been doubled; and it now contains 32 furnaces similar to those constructed in 1866—the Morton system of sealing without lute having been adopted. Condensation is done by the passing of the gas along a slightly inclined main on the furnaces and in the condensers, erected in 1876 and 1881, of riveted wrought-iron pipes, 600 mm. diameter. The total cooling surface is 1288 square metres, or 3·28 square metres per 100 cubic metres of daily make. In 1882, two Beale exhausters were installed, worked by steam-engines directly connected thereto, and supplied with steam from a flat-bottomed horizontal boiler and a tubular boiler, each of 21 square metres heating surface. The gas was washed by washers and scrubbers on the Walker system—coke-towers, erected in 1882.

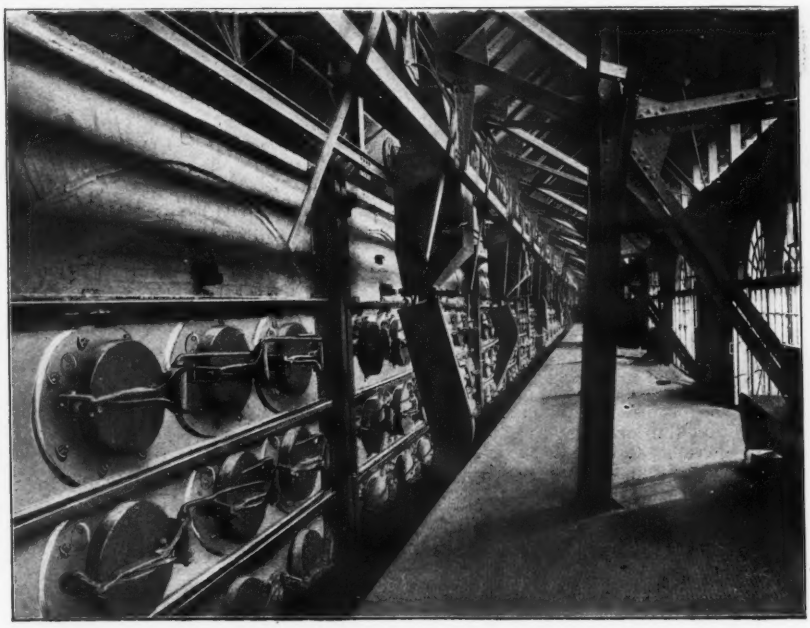
The purifiers put down about the same time were arranged in two series, each of four boxes, 4·5 by 4·5 by 1·3 metres, connected to a central distributor. These purifiers were worked with oxide of iron spread on four horizontal shelves. There were two station meters; the latter erected in 1882, and each supplying 1133 cubic metres of gas per hour. Each meter was placed in a cast-iron case, and each is in use at the present time.

There were three gasholders. The first, as already stated, was erected in 1866. A second, similar to it, was constructed in 1868. Both are of the two-lift type. The third, first constructed in 1882, was originally of the two-lift type also, but a third lift was added in 1892, giving the holder a capacity of 13,600 metres; thus affording a total storage of 25,250 cubic metres for a maximum make of 39,733 per twenty-four hours. Four Cowan regulators were used for the supply of the gas, permitting a maximum pressure during the night of 50 mm.

From 1892 to 1899 the works underwent little further change. The maximum make in 1899 was 48,140 cubic metres; but during this year a gasholder of 35,000 cubic metres was constructed, of three lifts, with a sheet-iron tank. The area of the works was considerably extended by the purchase of a site towards the north; but it was not until the period 1900 to 1910 that the most important extensions were carried out. At the present time, the productive capacity of the works is 135,000 cubic metres per 24 hours. It may also be said that, as regards the perfection of its plant, the works are not excelled by the most important establishments on the Continent.

THE HANDLING OF COAL.

Although provision has not yet been made for the handling of the coal by machinery, the lack of this facility has not been felt. The coal is stored for the most part in the open air in the north-east part of the works, though a covered store is provided between the house containing the vertical retorts and that for those to be put up. The unloading and stacking of the coal are done by manual labour. The space is enough for a stock of 16,000 metric tons, representing a consumption of about 80 days in winter, and assuming that the coal is stacked to a height of 2·5 metres, leaving a clear space for the railway lines. On delivery at the works, the coal can be conveyed direct to the crushers and elevators for the vertical or inclined retorts. What cannot be stored in the supply hoppers above the retorts—and very often this is an appreciable quantity—is put into stock. On the other hand, when the supplies which come in are insufficient for the current make of gas, small trucks, filled with the shovel, are used in taking coal from stock. The quantities thus taken are weighed and registered by an automatic Avery weighing machine, which is operated by a ½-H.P. electric motor, and can deal with charges up to 600 kilos., and 30 tons per hour. The coal for the vertical retorts is placed at the top level of the coal



Settings of Inclined Retorts—Charging Stage.

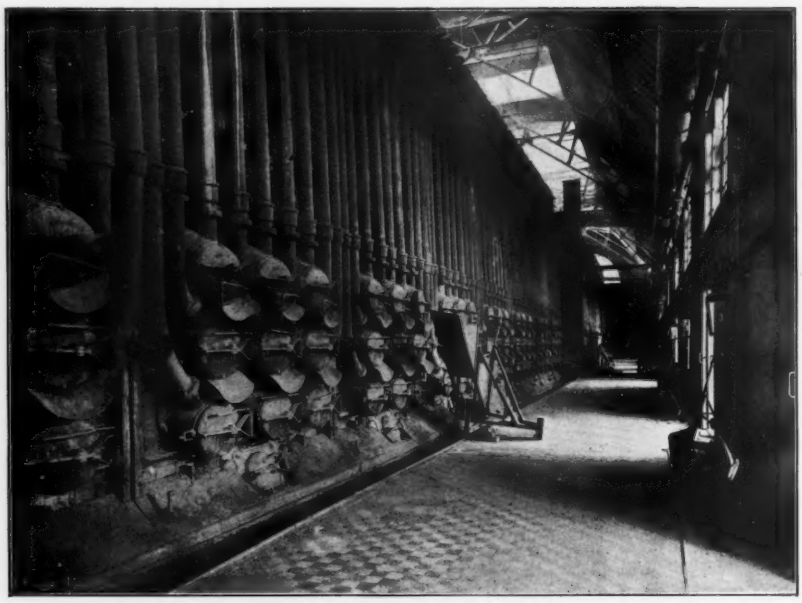
elevator. It is actuated by gravity, and is able to deal with the same quantity as that for the inclined retorts.

The coal employed is capable of rigid supervision (allowing of labour being on a piecework basis), which is an advantage in several respects, as coal from a variety of sources is distilled as mixtures of different compositions, which require to be somewhat carefully adjusted. The daily supply of coal does not allow of these mixtures being prepared, and therefore it is necessary almost every day to draw from stock.

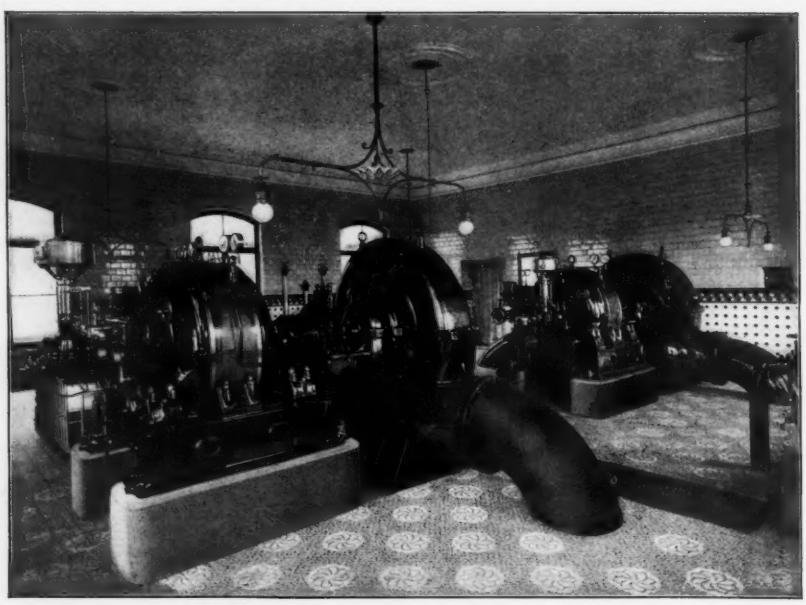
Inclined Retorts.

Sixteen settings of inclined retorts are used, divided into two benches. The first was constructed in 1906; the second, which is exactly similar to the first, and forms a continuation of it, was put up in 1907. Both are placed in the same house. The charging floor, which is reached by a staircase, runs the length of the furnaces, and is considerably higher than the lower arris of the retorts below. This has the advantage that the retorts of all the three floors can be readily examined, and charging is more easily done, as is also the removal of the carbon. Moreover, the floor is kept clean, as it does not receive the coal which is bound to fall from the conveying vessels during charging. It falls on a gangway under the mouths of the lower retorts, and can be easily removed with the shovel. The length of the floor is well ventilated by openings. There is never the least steam or smoke. A staircase connects the charging floor with the discharging floor, access to which is obtained at any point, without disturbing the workmen, by a gangway on the outside, which is at the same level throughout the whole length of the building. A number of doors afford communication with the interior.

There are in each setting, 9 retorts each 5·5 metres in length, of the normal section and 600 by 400 mm. dimensions (maximum and minimum). The normal charge of each retort is 400 kilos. The average time of distillation is 7 hours 12 minutes, depending, however, on the quantity of coal and its nature. The mouth of the generator furnace (provided with a Morton seal) is above this level, so that the furnace can be fed directly with the coke coming in an incandescent state from the retorts.



Settings of Inclined Retorts—Discharging Stage.



The Compressing Plant.

The floor on which clinker is removed is on the ground level of the works—an advantage as regards getting rid of slag, &c. This latter operation presents no difficulties; the furnace being of stepped construction. During the process, the mass of incandescent coke is retained by a false grating, the bars of which are kept cool by circulation of water. The furnaces are worked with a very moderate amount of labour.

As has been stated, the coal after delivery and weighing is carried by a chain conveyor to the crusher, whence it is raised by a chain of buckets. The latter carry it to the upper part of the retort-house, after which it is handled by a horizontal conveyor which takes it to the storage bunker, of a capacity of 250 metric tons, running the length of the house, and erected on staging of the building. A gangway runs along the length of this bunker, and permits of the distributors, which are placed at equally distant points, being regulated. Charging is done by means of Drory apparatus. The charging hoppers for the retorts are filled from the hoppers arranged on the lower part of the coal bunker—two hoppers per furnace. The charging hoppers run upon rails fixed on the staging in front of the

The Coke-Sorting Plant, with the Inclined Retort-House on the Right.

retorts; and they can thus be readily moved from one end of the house to the other. Their capacity can be regulated; but it does not exceed that of one retort. If the conveyor breaks down, a steam-elevator can be used for raising the coal.

All the apparatus above described is operated by belts from a single steam-engine. A second engine is kept in reserve. Nevertheless, the horizontal conveyor placed above the coal bunker can be actuated directly by a steam-motor placed at the other end of the retort-house.

The coke produced falls into a conveyor of the De Brouwer type, which is on the level of the discharging stage. This conveyor is divided into two parts, each of which serves eight benches, and is fitted with its own motor—a steam-engine of 3-H.P. The two motors can thus work independently of each other. The conveyor carries its coke into another of the Merz type, which takes the charge to the plant for crushing and sorting the coke [described later]. It has been thought necessary to employ the Merz conveyor in consequence of the very considerable difference of level along the distance through which the coke is conveyed. The Merz apparatus is worked by a similar vertical steam-engine of 3-H.P. The whole of the steam plant employed for the inclined retorts is being replaced by electric motors.

The installation of inclined retorts has been completed by a mechanical sorting plant for the coke. This is composed of a separating cylinder which is provided with a bucket conveyor and formed by bars 1·5 c.m. apart, which riddle out the coarse from the fine. The former is carried on a band (40 c.m. in width) to be sorted. After passing through a small crusher, the coke is carried by a small bucket conveyor, and stacked up. Coke of good quality is produced. It sells well, and serves as a perfect fuel for the boilers.

Compressing Plant.

The area over which the gas is supplied being a very extensive one, the ordinary pressure is not sufficient, and therefore during the winter of 1908-9 exhausters worked by locomotive engines were temporarily put down; and, in spite of the essential difficulties of such an installation, they have been used without trouble. A permanent installation was, however, established in 1909; and it commenced work in October of that year. The gas is forced directly, at an increased pressure, into the distributing mains; the pressure being adjusted by one of the ordinary governors. The plant consists of two similar groups of turbo-compressors capable of supplying 24,000 cubic metres per hour when working at a speed of 3000 revolutions per minute. The pressure of gas (of density 0·5) is a metre above the normal. The compressor is a one-cell centrifugal pump as designed by Professor Rateau; the turbine motor being of the "Electra" type of 160-H.P., with an adjustable regulator. Each turbine is supplied with a Westinghouse-Leblanc condenser actuated by an electro-motor, or else by a 20-H.P. Laval turbine if electric current is not available. The consumption of power is thus very small. At full charge, the consumption of steam reaches about 0·9 kilo. per effective horse power. The installation calls for very little manual labour. One man can attend to the whole plant with ease. He first starts the turbine and its condenser with all the gas-valves closed. Then, when the working speed is attained (which is seen from the tachymeter on the turbine), the supply of gas is regulated by opening the requisite valves. The arrangement of the valves and of the gas-mains allows of the following adjustments: (1) Separate compression on one or more parts of the system; (2) separate compression from one gasholder into another; (3) operations Nos. 1 and 2 effected simultaneously without risk; (4) working of the two groups of compressors in parallel.

Bye-Products.

As has been remarked, on its removal from the retorts the coke is taken to the crushing and sorting plant; but it may also be conveyed into bunkers holding about 150 metric tons, of which there are two—one for the inclined and the other for the vertical retorts. These bunkers are kept for several purposes, the chief of which are: (1) Complete separation of the two cokes. This is of importance, as the coke from the vertical retorts has special qualities. (2) Relief of the crushing and separating plant by provision of storage for the coke made during the night or any which exceeds the capacity of the plant. (3) Facilities for charging being done direct from the large coke-waggons, owing to the discharging table which is placed under the hopper of the bunker. Everything reaching the discharging stage passes into an excavation, from which it is carried by a vertical elevator to the crushing plant. This latter, which can be dispensed with if there is no pressing need of sorted coke, scatters the coke on a large table provided with perforated wrought-iron plates.

The coke then falls into one or other of the following categories: (1) Dust; (2) breeze; (3) No. "0"; (4) No. "1"; (5) No. "2"; (6) coarse. The sorted coke goes into separate bunkers of a capacity of from 1500 to 3000 hectolitres, provided on the sides and at the lower part with discharge hoppers by which carts can be loaded or even bags containing one hectolitre of coke delivered for retail sale. In the latter case, the coke is measured by means of a vessel gauged to contain a hectolitre. These bunkers are also provided with special openings, from which can be supplied small trucks traversing the gangways and conveying any coke in excess to the stock to which it properly belongs, or the trucks can supply coke when the demand exceeds the production.

(To be continued.)

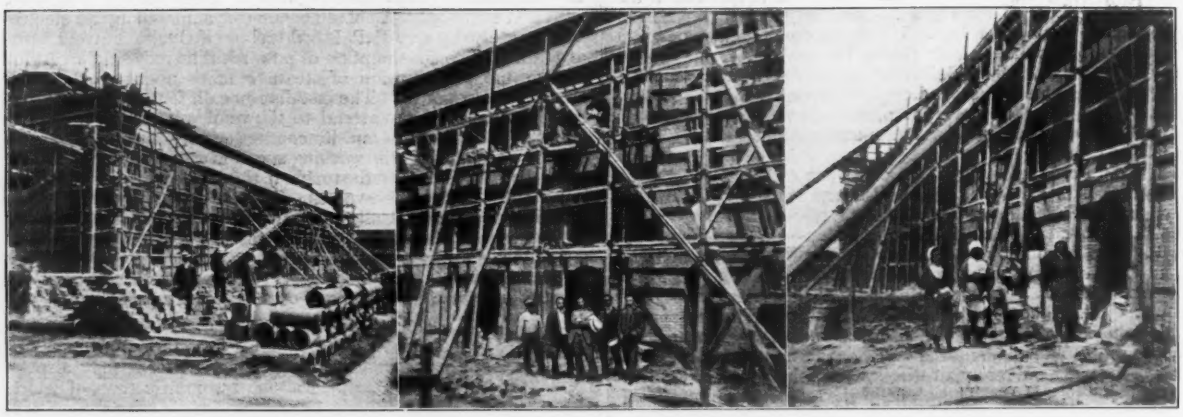
SOME IMPRESSIONS OF A TOUR.

While not, of course, in any way claiming to have made a record for quick travelling, which was not the object with which he set out on his journey, Mr. Charles Bland, of the Bland Light Syndicate, informed a "Journal" representative who called upon him a few days since that he had just returned from a trip round the world which—including both intentional and involuntary stoppages—had been performed in a time that would certainly have astonished M. Jules Verne when he was writing his exciting book "Round the World in Eighty Days." In making the circuit of the earth, Mr. Bland was absent from England 53 days, during which time he travelled nearly 19,000 miles—19½ days being spent in railway trains, and 21 days on board ship. These figures are rather interesting, as giving some indication of what, even with short stoppages, can be accomplished by those in a hurry—and who is not?—under modern conditions of travel. That Mr. Bland, being a man of observation and a man of business, has profited personally by his tour, we have not the slightest doubt. Wide travel must be good for everybody; but for Englishmen it usually possesses the additional advantage of still further increasing their appreciation of their own country. Mr. Bland's absence, short though it was in point of time, was long enough to have this effect upon him. Just what he has seen and what he has done while away, were unfolded in the course of an interview; and to anyone who may think that to "go and do likewise" would be a good way of spending a summer vacation, the following brief outline of Mr. Bland's remarks should be of use, while to others let us hope they will prove of interest.

Starting from Charing Cross on Monday, April 25, and travelling straight through, *via* Ostend, Brussels, Berlin, and Warsaw, Moscow was duly reached; and from this point, after a halt of an hour or two, began the long journey on the Trans-Siberian Railway to Vladivostock. The numberless villages which were passed gave the impression—which no doubt was a perfectly correct one—that the peasants are very poor. At every stopping station the passengers were beset by beggars, mostly clad in filthy rags. Roads there are conspicuous by their absence. Crossing over the Ural Mountains, some magnificent views were obtained; and a fifty-minute stop at Tcheliabinsk, afforded an opportunity of visiting the town and one of the churches. In this part of the world, every effort is made to prevent the taking of photographs; and should an enthusiast find it impossible to refrain, he must either bribe the police or bring his camera into action when their backs are turned. Omsk, the Capital of Siberia, was the next important place reached; and here Mr. Bland had to part with one of his travelling companions, who, curiously enough, was visiting that town with the object of securing a contract of the value of over a million pounds sterling, for putting down sewage works, paving streets, and erecting gas and electricity works. It seems that there is a lot of money at Omsk; and apparently it is in a very thriving condition, as the land round there is owned by wealthy Russians who were at one time exiled from their country. From Omsk, the country for a thousand miles or so was of a flat and swampy nature; but the tedium of this part of the journey was relieved by the excellence of the railway arrangements. The train was run by the Wagons-Lits Company; the rolling-stock being precisely the same as that which is familiar to travellers in Europe. Subsequently, the country gradually improved, and beautiful scenery was passed through—very similar to that which is encountered east of Winnipeg. At Lake Baikal, there was a change of trains. The lake was covered with ice; and later when Boisa, on the borders of Mongolia, was reached, it was snowing hard, and news was received that a snow block had taken place 15 miles ahead. Such an event was unheard of at that time of the year (May 5); and the railway authorities were consequently quite unprepared for it. However, 400 or 500 men were put to work; and ultimately this obstacle was removed, and the train proceeded on its way, after a delay of 36 hours.

The travellers reached Vladivostock early in the morning of May 9, only to find that, in consequence of the stoppage at Boisa, they had missed the steamer connection to Tsuruga, in Japan, and would have to wait four days for the next boat. Vladivostock, which is beautifully situated in a fine harbour, is, of course, a town under military law. Except for walking up and down the main street, there is nothing to be done there; the only amusement offered being a few cinematograph shows. Even the selling of photographs and picture postcards is prohibited. However, the time was whiled away somehow, and Vladivostock was left on May 12—the s.s. "Raizan" having a smooth passage to Tsuruga, which was reached two days later.

While in Japan, Mr. Bland visited a number of towns; though he had to curtail his stay, in consequence of the unfortunate delay which had taken place at Vladivostock. Hospitality was everywhere extended to the visitor, who, of course, inspected all the



Kyoto Gas-Works in Course of Erection.

gas-works he could, and found them apparently in a very flourishing condition, in spite of the competition of electricity. Everywhere modern machinery and appliances were to be seen; and the works are run entirely by Japanese engineers, who keep in touch with European methods by carefully studying the technical papers. They displayed the utmost keenness to learn everything possible with regard to what was going on, and what new appliances were being placed upon the market.

The three illustrations are photographs of buildings in course of erection in connection with a gas-works for Kyoto. In the "JOURNAL" for Nov. 24, 1908 (p. 558), there appeared—in connection with the series of articles "Round the World—and Some Gas-Works"—a photograph of the street-lighting arrangements at Kyoto, which was at that time carried out solely by means of Japanese lanterns; and it was stated by Mr. Maurice Graham that, though Kyoto had a population of 500,000, there were no gas-works there. It was, he added, said that a Company had had a concession for over two years for gas lighting; but unfortunately the financial depression in the country had delayed matters. The gas-works now being put up—which it is hoped will be completed by the end of the year—will doubtless soon result in an alteration of the primitive street lighting then in vogue. Electricity has for some time been installed in the town; but, in spite of this, confidence is expressed that gas will be able to fairly hold its own, as the Japanese are rapidly learning the advantages to be derived from cooking and heating by gas. Kyoto, which is a very interesting place, was originally, it may be mentioned, the Capital of Japan. It was the home of Buddhism; and there are many ancient temples to be seen there—some of them at least 1200 years old. Referring to Japan generally, Mr. Bland emphatically maintains that the country and people have been in no way over-rated. The men are keen and business-like; the women most charming; and the country lovely. The treaty ports—such as Kobe, Yokohama, and Tokio—are, of course, very much European. There are large houses and shops; and the Japanese in these towns have generally adopted European dress. But in the inland towns, all the quaint and interesting Japanese customs still prevail. So pleased was Mr. Bland with his reception in the Island, that he wishes to make special acknowledgment of his indebtedness to the Engineers and other officials of the various gas-works visited, and to express his great appreciation of the kindness that was everywhere, and in every possible manner, extended to him.

To resume the story of the travel. "Good-bye" was said to Yokohama on May 24, when the Canadian Pacific mail steamer "Empress of India" was boarded. The sea was calm, but the weather most unpleasant. The northerly route taken was an extremely cold one. In fact, for seven days the sun was not seen; and when eventually it did show itself for a few minutes, and observations could be taken, it was found that the ship was further north than had been expected. Pleasure was manifested when the fine harbour of Vancouver was reached. Only two hours were spent there; but even this short time was sufficient to give one the impression that very great prosperity prevailed. The town was all hurry and bustle—thus indicating that there was a lot of business doing. The Canadian Pacific Railway was next joined, *en route* for Montreal. First there was to be enjoyed the beautiful scenery of the Rockies; and afterwards the fertile plains of Western Canada were crossed, where towns spring up like magic. Over a journey of 900 miles, the development of farm life could be fully studied; and though the country is, of course, quite flat, there was much interest in the "life" to be seen. Montreal was reached on June 9, and the same evening the R.M.SS. "Virginian" (of the Allan Line) was boarded. The weather was beautiful, and the run down the St. Lawrence most enjoyable. Again the northerly route was taken through the Straits of Belle Isle; and any number of icebergs were encountered—an appropriate circumstance, in view of the fact that among the passengers was Sir Ernest Shackleton. After an otherwise uneventful voyage, Liverpool was safely reached on June 17.

THE INSPECTION OF FACTORIES.

THERE was recently issued as a Blue-Book the report for 1909 of the Chief Inspector of Factories and Workshops (Dr. Arthur Whitelegge, C.B.), which, as usual, contains references to some matters in which readers of the "JOURNAL" are interested.

Before turning to the divisional reports, which are summarized by Mr. H. M. Robinson, it may be mentioned that Dr. Whitelegge himself has something to say with regard to the efficient lighting of factories. This is a subject, it seems, which has hitherto been carefully looked after abroad. There are in Holland especially some strict rules in force. The employment of women and young persons is forbidden in works in which artificial lighting is required (in the absence of exceptional meteorological conditions) between the hours of 9 a.m. and 3 p.m. In addition to this, there is the requirement of a definite standard of illumination for certain processes—15 bougies-metres (about 1·5 candle-feet) for embroidery, working in precious stones and gold and silver, the engraving of metal and wood, the manufacture of scientific instruments, printing, mechanical knitting and quilting, sewing, draughtmanship, and the repairing of clocks and watches; and 10 bougies-metres (about 1 candle-foot) in other industries in which a strong light is especially important. In the Belgian code, there is a converse provision, which requires that the operatives shall be protected from glare. He admits that the question of standards is beset by many difficulties, at present only imperfectly investigated; and that, in the absence of a standard, a broad requirement of adequate lighting is only a half-measure. Even as regards daylight, it is pointed out, there is no constancy in the illumination of a whole room; and there are many things that have to be taken into account. Then with artificial light other considerations arise, apart from contamination of air by all except electric light and ventilated gas-burners—namely, the quality of the light and the intensity of the source from which it is radiated. It appears, says Dr. Whitelegge, that artificial light in which the rays from the violet (actinic) end of the spectrum predominate, may on that account be less efficient, at all events for certain kinds of work, and that radiation from a small but intensely luminous source, such as an unshaded electric light, may be more trying to the sight, and hence less effective, than the same amount of light diffused from a larger surface. He adds that the subject as affecting industrial employment is not one which admits of settlement by a stroke of the pen; and close investigation of the conditions will be necessary. As a beginning, Mr. D. R. Wilson, one of the Inspectors, has been directed to inquire into the present lighting of certain classes of work-rooms, beginning with underground bakehouses in London.

Turning to the summary of sectional reports, it is found that most of the staff again comment on the greater use in factories of suction gas or electricity as a motive power; and one Inspector estimates that the electrical energy generated for this purpose has increased by 100,000 H.P. as compared with 1908. All the reports speak of the attention given to the proper ventilation of suction-gas plants. A memorandum issued from the central office, pointing out the dangers to be guarded against, and the precautions to be adopted, has been widely circulated. Several cases of poisoning were noted. Another Inspector describes a curious case caused by the discharge of the engine-exhaust into a passage in which carts stood while being loaded at the factory. Eight horses were affected by the fumes, and died. One official mentions that inquiry into the manufacture of incandescent mantles disclosed unpleasant effects on the workers from the vapour arising from the baths in which the mantles are dipped, and from excess of carbon dioxide generated in the process of seasoning. Exhaust ventilation has had beneficial results.

Flueless gas-stoves are dealt with by several of the Inspectors. Mr. A. P. Vaughan, of the South-Eastern Division, says there are still found cases where the crude means of warming by open coke-fires in buckets or by ordinary gas-jets are used, and have to be prohibited. Between the two extremes of highly satisfactory and highly unsatisfactory methods of warming, come flueless gas-

stoves and hot-water radiators with unventilated gas-burners beneath. These have been noticed in many places; and, he says, however effective they may be in securing a "reasonable temperature," they raise the question as to whether they do not interfere with the purity of the air. Mr. A. Lewis, of the South-Western Division, points out that each of the Inspectors has a word to say on the troublesome flueless stove and radiator; and the consensus of opinion expressed is against the use of them as heating agents. The experience of occupiers also tends to uphold the same view; and for this reason the use of the stoves and radiators has been voluntarily discontinued in favour of other means of heating. Mr. J. H. Walmsley, of the Midland Division, also referring to flueless gas-stoves, remarks that the attention of occupiers has been called to the necessity for preventing fumes escaping into the workrooms; and much has been done to make things satisfactory. Mr. J. A. Hine, of the North-Eastern Division, reports that Mr. Younger, of the Halifax District, had an air sample taken in a small work-room warmed by means of a flueless stove; and it showed 47·8 parts of carbonic acid per 10,000. Another sample, after the stove had been replaced by another gas-stove fitted with a flue, contained 18·2 parts only of carbonic acid, not in itself a good result, but an illustration of the extent to which the air was polluted by the flueless stove. Mr. Dunolly, of the Stockton District, remarks that the fumes generated from all gas-stoves are heavier than air at the same temperature. They rise solely by reason of their being at first hotter than the surrounding air; and as soon as they enter a long, narrow flue, they readily lose heat and form a complete stoppage to any further passage of the fumes up the flue. A short, wide flue for all gas-stoves is therefore essential. Mr. Butler, of the Huddersfield District, notes that it is very unusual to find any gas or oil stoves used for regulating temperature without flues for carrying away the exhaust. Occasionally in tailors' work-rooms a gas-stove used for the heating of irons is found to be unventilated; and as such stoves are a factor in maintaining the temperature of the room, he has required ventilation, either by inserting them in an open fireplace or providing special flues. Water-radiators with a small gas-jet are not employed at all. Whatever use they may be in ordinary sale rooms, offices, &c., he has found that they are quite inadequate for the heating of work-rooms. Mr. R. E. Graves, of the Northern Division, remarks that, in spite of all that has been written and said by Inspectors on the use of flueless gas-stoves and radiators, they continue to be increasingly employed. In large rooms not very fully populated, and provided with sufficient natural outlets, the objections are not so great; but in small rooms, where windows and doors are the only means of ventilation, such contrivances cannot but be injurious; and he invariably requires ample ventilation. Many samples have been taken to test the conditions; and in almost every case a very high percentage of carbonic acid has been found in conjunction with flueless stoves. Miss Slocock, one of the Lady Inspectors, says that gas-stoves are being utilized more and more as a means of warming; and with a good flue fitted straight into the chimney, they seem to answer well, and to have no unpleasant effects, beyond making the air of the room very dry. But fitted with flues with many right-angled turns, they are not so satisfactory; and without flues they vitiate the atmosphere. "Electric radiators for heating would appear to be the solution of the difficulty in rooms where a flue is impossible;" but she is "still informed that the cost is prohibitive."

There is reported by Mr. Bremner Davis, of the Kent District-a case with one fatal result which occurred during the year in connection with a water-gas plant recently installed in a gas, works.

The wrought-iron duct leading from the blowing fans to the generator was shattered; and the man was struck by pieces of it. The case is important as indicating a danger probably existing in many similar plants, and which might be better guarded against than it generally is. The operator's evidence showed that the plant pressure had been tending to be high during the day; but while he knew there was a little, he did not consider that serious blocking of the scrubber was taking place. After the explosion, however, it was found that there had been a block there; and this necessarily meant that the pressure must have risen considerably, and possibly in quite a short interval. Unfortunately, the operator did not realize the danger of this, and was not certain that he had looked at the generator gauges just before he opened the blast-valve in the usual course. Immediately it was opened, the explosion occurred in the blast-duct.

Gas can get into this only in two ways—either by leakage past the valve faces when the valve is closed, or by overcoming and forcing back the blast-pressure when the valve is opened; and this can happen only if the pressure on the generator side is greater than that of the blast. In this instance, leakage past the closed valve can be excluded. The valves are of excellent design and construction, with double faces and a powerful wedge action for sealing them. It was proved that the faces were not corroded. Above all, however, the space between the two faces is ventilated to the open air. Even if both faces did leak—in itself excessively improbable with an uncorroded valve—the vent prevented any gas getting back against the blast-pressure into the duct. It is therefore practically certain that, when the valve was opened, a back-rush of gas took place by reason of the high pressure. This formed an explosive mixture with the air; and the red-hot generator ignited it. I happened to be almost an eye-witness, as I was close to the place at the time, and so had an unusual opportunity of first-hand information.

Since then I have visited many water-gas plants, and have found present, in many of them, some or all of the following sources of danger whose existence might lead to a similar explosion: No separate pressure-gauge on the blast-pipe side of the blast-valve, or one placed some distance from the other gauges, so that comparison between them is awkward and likely to be omitted by the operator. They should be close together on the same scale and level, so that the difference between their levels is patent to the eye. Those in charge have not realized that it is essential to safety that these two gauges in particular should be observed and compared by the operator immediately before the blast-valve is opened on every occasion. This, with properly placed gauges, occupies only a fraction of a second. The usual large relief opening was provided in the ducts in the case in point; and unfortunately the idea is widespread that explosions are thereby rendered of small moment. This was effectually disproved by the accident in question; and it is no more to be expected that thin steel duct of large diameter should be kept from fracture by relief openings, than a gun barrel would be by its opening to the barrel, were its metal proportionately thin. Practically no gun construction yet evolved will stand really high explosives; and yet there is a free opening of the barrel. The explanation, well enough known to those concerned, need not be mentioned here.

Interlocking gear in other parts of the apparatus is fitted by some makers, in order to prevent incorrect relative movement of different valves; and it acts excellently. To prevent this wrong opening of the blast-valve, however, while interlocking gear is not impossible, it would be complex, and perhaps be apt to get out of order. It could be done by a differential mechanism operated by pistons or diaphragms connected with each of the two pressures; or by an electrical make-and-break within the glass of a differential gauge with a relay and electro-magnetic or even weight or spring actuated locking mechanism.

Water-gas operators are usually intelligent and reliable men; and if they are made to realize the point, and provided with the simple appliances before named, there would be reasonably adequate protection against explosion from the cause in point.

Among the other accidents (which include more than one acetylene explosion), the following case is reported from the Swansea District. An explosion occurred at an oil-gas works where the gas is produced as the result of the destructive distillation of crude petroleum oils. The products of decomposition in these cases are all of a highly inflammable and dangerous nature. In this particular instance, a woman had taken her child to the gas-works to inhale the fumes from the oil gas as a cure for whooping cough. While they were standing near the tank in which the liquid portions of the distillate condense, there was a sudden flash, and they were enveloped in flames; the woman being immediately burnt to death, and the child dying two days after. The explosion was probably caused by the volatile liquid in the tank evaporating and the resulting vapour gradually creeping outwards to a railway track just outside. A heavy train was being spragged on the siding; and the friction between the wheels and rails caused a spark which fired the vapour. Several of the Birmingham Inspectors report explosions, some of which have occurred at enamelling stoves. Attention has been drawn to the possibility of explosion through the employment of naked gas-lights in near proximity to the doors of enamelling stoves heated by bunsen burners, which are usually arranged in rows near the floor of the stove. Accidents have also been caused by the extinction of the bunsens, possibly by a sudden draught when closing the doors, and the subsequent ignition of the accumulated gas when the doors of the stove were re-opened. An explosion occurred in the crank-chamber of a large four-cylinder vertical gas-engine, with the result that the cover of the two-to-one gear was blown off. It is impossible for gas to get into this chamber. All the bearings are lubricated by means of a system of forced lubrication, the oil being forced by means of a pump through tubes and channels to each bearing. That forced to the crank-shaft and crank-bearings escapes into the crank-chamber, whence it flows to the sump, from which it is again pumped. The crank-chamber becomes heated to a fair temperature, and the revolution of the cranks causes a large amount of splashing; so that the atmosphere of the chamber is full of oil vapour caused by spraying principally. Ordinarily, there is no possibility of the mixture of air and oil vapour becoming ignited; but in this case the hollow piston galled and heated to such an extent that oxidation of the metal resulted. This, of course, implies that a very high temperature was reached; and it is assumed that this ignited the explosive mixture. Ventilation of the crank-chamber is provided by means of two pipes—one admitting air, a second, at the other end of a chamber, allowing of its escape. From this second pipe, vapour was issuing in the case of another similar engine at the time of the visit. A like explosion is said to have happened at another factory. There are, it is stated, still grounds for complaint with regard to the unsatisfactory methods of fencing gas-engine fly-wheels. An instance is given of an accident (which resulted fatally) to a workman while engaged in taking out the piston of a gas-engine. The supply of gas was shut off at the principal valve, and the engine allowed to run itself to a stand. The man then uncoupled the connecting-rod, and, holding it in his hands, called for the crank to be turned into a new position. While this was being done, and owing to the electrical ignition device not having been disconnected, some gas lurking in the end of the cylinder was fired, which, all resistance having been removed, blew the connecting-rod with great force against him. Attention of gas-engine attendants at these works is now, by notice affixed on the engine, drawn to the dangers resulting from not disconnecting the ignition device.

Mr. Jackson, of the Liverpool District, draws attention to the fact that many accidents are due to carelessness; and he suggests as a remedy the adoption of such a scheme as is in force in a very large works in his district. Briefly the scheme is this: The works are divided into departments, and each department has its own divisional committee, elected annually, half the members of which

are workmen and half are foremen, with the head of the department as chairman. Their duties consist of (1) considering and reporting upon any suggestions that may be made to them for improvements in their department, either as to manufacture or better fencing, or safer modes of working; (2) to see the rules of the works are properly carried out, and to prevent waste or irregularities; (3) to investigate all accidents reported, and to ascertain the cause, and say if anyone is to blame; (4) to hear appeals from employees with regard to dismissal, &c. They also make a quarterly inspection of the machinery and plant used in their department, and report if fencing, &c., has been properly maintained. Their reports are considered by the managing-director and his colleagues; and their recommendations, if approved, are adopted. In regard to accidents, their finding is posted up in the department concerned; and it is found to be an excellent check on carelessness, for no worker likes to be posted. As a result of this scheme, the works are a model of fencing and efficiency in working. In 1909, only 86 reportable accidents occurred, with 4364 persons employed, or less than 2 per cent. Of these, one was fatal, none were classed as severe, and only six as moderately severe.

The danger of poisoning by carbonic oxide, which is particularly associated with the manufacture and use of suction gas, producer gas, and water and other power gases is better known and appreciated, says Mr. Vaughan. In country parts, the gas plant is usually placed in the open air outside the factory; but in towns, and in London especially, it is more often in some confined space. The question of ventilation has here become important, and in the case of newer gas plants has been satisfactorily dealt with; the engine-houses being well ventilated to the open air, and the air-intake for the engine being, in many instances, arranged from the outside, instead of from the engine-house itself. One firm have devised a simple arrangement for detecting gas leakage. The gas-cylinder is fixed, and a small cup containing water is screwed on to the valve, which is placed uppermost, so that the bubbles of any escaping gas could be seen, and an empty cylinder at the critical moment be presented. Mr. Lewis says the rapid growth in the use of producer gas for power points to the advisability of urging the makers of various plants to see, at the time of installation, that the rooms where they are fixed (often in basements) are suitably ventilated. Every endeavour is made by the Inspectors generally to impress upon those in charge of these plants the dangerous nature of the gas, the personal precautions necessary, and the importance of taking steps to prevent the diffusion of the gas into the engine-house and other parts of the works. Mr. Walmsley points out that part of the Walsall district is within the area of the Mond Gas Company's undertaking. No complaints have been received of any excess of carbon monoxide, which is limited by the Company's Act to 14 per cent., while the gas certainly possesses "a distinctive and readily perceptible smell," which is also stipulated in the same Act. Mr. Rogers, of the Birmingham District, says, with regard to carbonic oxide poisoning: The only case of any moment that came to our notice last year was that of the occupier of a small factory who was found dead on the floor of his gas-engine room. The gas-pipe from the town supply, which contained some carburetted water gas, was found disconnected, with the gas on. The post-mortem examination disclosed signs of carbonic oxide poisoning. Several cases of defective air-intake and of badly-ventilated gas-engine rooms have been dealt with. In one case it was urged that producer gas used for heating stoves should be given a distinctive and easily perceptible smell. In another factory, the waste-pipe for blowing off the gas when starting the suction-gas producer was found discharging into the air of the work-room, 14 feet above the floor. This pipe was continued to the open air. Special attention throughout the division has been given to the ventilation of engine-houses where water gas and similar gases (suction gas, Dowson gas, Mond gas, &c.) are used. In many cases the air intake to the engine-house has been removed from the inside to the outside, and additional ventilation provided. From Huddersfield there are reported two cases of carbonic oxide poisoning—one from an ordinary escape of gas, and the other in connection with a suction-gas plant. One Inspector remarks upon the carelessness and risk run by some attendants at producer-gas plants. In the Liverpool District, Mr. Jackson says that much time has been given to the ventilation of suction-gas plants; and considerable help has been received from manufacturers and their architects (as well as from the makers), who have consulted him as to what ventilation was required. They have been told that mechanical ventilation would be insisted upon, if the plant was put in a basement.

Under the heading of sanitation, Mr. G. Bellhouse, of the North Western Division, gives a record of air samples, and to them appends the following note: The returns indicate a good standard of ventilation; and it is specially interesting to note the results obtained in gassing rooms, where a high proportion of carbonic acid might be expected from the gas-jets. As a fact, however, no sample showed a proportion higher than 14·5 parts per 10,000; and one Inspector quotes a case where it was only 3·3. Another Inspector similarly reports satisfactory results being obtained from ironing rooms in laundries, which varied from 4·0 to 6·5 parts per 10,000. The worst results were obtained in tailoring and dress-making workshops; and may be attributed to either unsuitable means of heating or to the means of ventilation not being properly applied. As an example, an Inspector quotes a case where in the first instance the analysis showed a proportion of 59·9 per 10,000. The room was heated by a flueless, gas-heated radiator. This was removed, and a stove with a flue was fixed in its place. A further analysis then showed that the proportion had been reduced to 17·4. A Lady Inspector says: One of the industries in which excessive temperatures are most constantly found is that of incandescent gas-mantle making. In the burning-off and seasoning departments of those visited, where the heat is very great and the distribution of the plant makes control of it difficult, a good deal has been done to minimize this by special ventilation, but with only partial success. None of those I have visited were built for an industry of this kind; and the difficulty of unsuitable premises is naturally great where there are processes or material requiring unusual conditions.

Mr. Lewis remarks that a matter respecting which all doubt appears now to have been removed is the necessity for connecting the fume-pipes of all gas-ironing machines in laundries with an efficient fan exhausting into the open air. The Inspector for Plymouth makes mention of workrooms wherein he found large burners for heating irons without any means provided for taking away the fumes. They were generally placed in front of a fire-place, because the occupiers thought the fumes would pass up the chimney. The effect, however, was the opposite. The heat of the irons rose in front of the fireplace, and caused the air of the room to be hotter than the air in the chimney; and the fumes were therefore carried across the room. Mr. Walmsley reports improvement generally in the use of gas-irons in laundries. Mr. Nicholl, of the Lincoln District, says the manager of one laundry pointed out an improvement he had made in his ironing room. Gas-heated hand irons had been removed, and were replaced by ordinary irons heated on gas-stoves of his own invention, placed at arm's length in front of the workers—not only removing the combustion products from under the workers' heads, but making it possible to fix hoods and ducts to remove the fumes.

An Inspector in the Leeds District observes that it was noted, on visiting a small gas-works in a country town, that the smoke-stack was over a foot from the perpendicular, and seemed likely to fall; the wall behind the retorts was slipping away from the roof; a roof principal was broken and propped up by 2 feet of plank placed on end on the top of the not too strong hollow brick-work forming the flues; and the purifiers were in an unventilated outhouse, and leaked badly. The company were requested to undertake repairs promptly, which they did. New works are, it is pointed out, now in course of erection.

In the report of the Medical Inspector (Dr. T. M. Legge), the following statement by Dr. Collis on the subject of the manufacture of incandescent mantles is quoted: Four factories where incandescent gas-mantles are manufactured have been visited, to ascertain whether under the present conditions of work any injury is caused to the workers (1) by vapour arising from the baths in which the mantles are dipped; (2) excess of carbon dioxide generated in the process of seasoning or burning. The dipping-baths contain a mixture of methylated ether (industrial spirit) 60 per cent., and methylated spirit 30 per cent., in which is dissolved collodion and camphor. The vapour arising from this mixture, if breathed to any extent by the workers, causes headache, sickness, anorexia, sleepiness, and lassitude—symptoms which are experienced to a greater extent on first commencing employment. At one factory, where the workers had to enter the hot stoves, heated to about 115° Fahr., to carry in mantles for drying, and to remove the dried mantles, all seven workers complained of some of the symptoms described. These stoves have since been reconstructed, with beneficial results. Suitable hoods and exhaust ducts, minimizing the amount of vapour which escapes, can be fixed over the dipping-baths.

In the process of seasoning or burning-off, carbon dioxide is given off by the large number of bunsen burner jets employed. In one room there were about 640 jets in use for 80 workers. The products of combustion are removed by localized exhaust in only two of the factories visited. Consequently, the amount of carbon dioxide found in these rooms becomes excessive, even though there is good general ventilation effected by means of adequate exhaust fans.

Action of Air on Coal.—In a recent number of the "Comptes Rendus," M. Mahler dealt with this subject. According to an abstract of his communication contained in the "Journal of the Society of Chemical Industry," on passing a current of dried and purified air over finely powdered dried coal (different samples of French coals) at temperatures up to 105° C., water, carbon dioxide, and carbon monoxide were produced; the quantities increasing in general with the temperature, but varying according to the state of division of the coal and the velocity of the air current. For example, 150 grammes of a coal from Courrières yielded in 30 hours the following quantities of carbon dioxide and monoxide respectively at the temperatures mentioned: 25° to 30° C., 1 c.c., 2·88 c.c.; 45° C., 1·55 c.c., 3·73 c.c.; 65° C., 4·25 c.c., 5·59 c.c.; 85° C., 12 c.c., 4·97 c.c.; 105° C., 30 c.c., 6·67 c.c. When the coal was not first dried, the production of carbon monoxide was much smaller—viz., 1·13 c.c. in 30 hours at 35° C. Experiments were also made under similar conditions at higher temperatures; and it was found that above 125° C. there was a considerable increase in the amounts of water, carbon dioxide, and carbon monoxide produced, while indications were also obtained of the formation of hydrocarbons. Above 150° C., the condensed water was distinctly acid, and had an acetic odour.

EXAMINATION IN "GAS SUPPLY"—THIRD YEAR.

Answers to the Questions Set.

THE City and Guilds Examinations for the third year in "Gas Supply" have now been completed, and the list of successful candidates issued. Although the results have been communicated to the local centres, the City and Guilds of London Institute has, as already mentioned in the "JOURNAL," so far withheld them from the Technical Press. This proceeding must be much regretted by all who have the true interests of the courses in "Gas Engineering" and "Gas Supply" at heart. The Technical Press, by the publicity given in its columns to the examination courses has, we venture to think, been a greater factor in bringing these examinations before the notice of the young men of the industry than the mere announcement of them in the programme of the City and Guilds of London Institute. These programmes are only supplied, as a rule, to the Secretaries of the Technical Institutes and to the Press. The Secretaries of the Institutes cannot be expected to have that special interest in one particular course which editors of journals devoted to the industry which that special course represents have; and therefore, for popularizing the examinations, the editors' influence must be considered as greater than the secretarial influence. While the latter is commendable so far as it goes, there does not appear to be any sound reason why the editors' sympathy should be alienated from the course. Each year they allowed to be published the syllabus which governs the examinations, and also extracts from the annual report of the City and Guilds of London Institute. It may at once be conceded that the publication of the pass list is an act of grace on the part of the City and Guilds officials; but it is an act of grace that conduces to mutual goodwill, and is certainly not to the disadvantage of the best interests of the examinations which concern the gas industry. The Council of the Institution is an Advisory Committee in connection with the examinations, and no doubt may be relied on to consider carefully the *pros* and *cons* of publication. Meanwhile, we quite hope that it will not be necessary for them to discuss this subject at all, but that the City and Guilds authorities will realize that the little extra trouble involved in the preparation of pass lists for technical journals is a practice that may be continued with advantage to the objects for which it was instituted.

We are able to ascertain from the report of the Council of the Institution that the number of candidates who sat this year in "Gas Supply" totalled 310. Of these, 93 were candidates in the Honours Grade—an increase of 12; and 217 were candidates in the Ordinary Grade—a decrease of 18. It would seem, therefore, that the annual number of candidates is settling down at the round figure of 300. This does not appear to be as many as might be expected, considering the enormous number of distribution employees who should have an all-round knowledge of most, if not all, of the matters enumerated in the syllabus. The City and Guilds certificate should be, as far as possible, a reliable indication of efficient training and study in this branch of gas technics; and if the character of the papers or the regulations governing the examination do not ensure this, the scheme should be modified accordingly.

At the last meeting of the Manchester District Institution of Gas Engineers, a proposal was put forward for the better training and education of gas-fitters. This matter was also dealt with at some length by the President of the Institution of Gas Engineers (Mr. J. W. Helps) in his recent address. The desirability of such an extension of systematic training was accentuated by the discussion on the report of the Gas-Heating Research Committee. In this discussion, it was clearly held, both by the research specialist, Mr. E. W. Smith, by gas engineers, and by makers of gas-fires, that the competence of the gas-fitter was an important factor in the success or otherwise of gas-heating appliances as installed at consumers' premises. Schemes for the better education of gas-fitters, however, should not in any way be inimical to the City and Guilds examinations in "Gas Supply." If certificates of proficiency are to be awarded to gas-fitters, the City and Guilds of London Institute is the proper authority for making such awards. For a long number of years this Institution has been recognized as the leading body for the conducting of technological examinations. The better training of gas-fitters was one of the subjects put down for discussion at the combined meeting of the Commercial Sections which was held at the Institution of Mechanical Engineers on Tuesday, June 14. Owing to the length of the other business, however, consideration of the matter by the Joint Sections was deferred for twelve months. We do not see exactly what point there is in this subject that gives the Commercial Sections any special claim to consider it as distinct from the general body of members of the Institution, or their accredited representatives, to wit, the Council. It has been pointed out that the Council are an Advisory Committee in connection with the existing examinations; and if any modification in training is desired or required, the Council is the proper authority to consider the matter in all its bearings.

An examination for gas-fitters might very well be made a preliminary (though not compulsory) course to the Ordinary Grade in "Gas Supply." The gas-fitter, having secured the preliminary fitter's diploma, would probably feel encouraged to continue his studies. Having acquired the habit of systematic training and study, it would not then appear so difficult to tackle the two courses in "Gas Supply" as at present. Unless there is greater evidence of study on the part of distribution employees than is shown by the number presenting themselves for examination, the industry cannot look forward too confidently to the keener fight which will be waged for light, heat, and power custom. A larger number of competent teachers should be available; and the heads of gas undertakings in the Provinces should emulate the example of Metropolitan and Suburban heads, who realize the importance of having an educated outside staff.

In this year's examinations, the candidates in "Gas Supply" had, as formerly, the choice of 14 questions in each grade, and of these not more than eight were to be answered. The marks awarded to the questions were modified somewhat as compared with previous years; for whereas formerly the questions had respectively a value of 36 or 39 marks, this year the marking varied from 30 to 45. In the Ordinary Grade, there was one question for which 45 marks were obtainable; and this was one to rightly answer which practical experience was almost absolutely essential. A similar remark may be applied to the two questions for which 42 marks were allowed. Generally speaking, the questions which were marked lowest were such as involved the minimum amount of practical experience.

Ordinary Grade Questions.

1. (A) Describe one form of leakage indicator suitable for locating escapes from gas-mains. A gas-main, 200 yards long, supplies 50 consumers, and is connected to the distributing system at both ends; how would you ascertain the amount of leakage (if any) from same?

Ansell's Leakage Indicator.—This instrument depends for its action upon the law of diffusion of gases, which is, "that gases diffuse at a rate inversely proportional to the square roots of their densities." The instrument is circular in form, about 6 inches high by 3 inches in diameter. The means by which the principle of diffusion is applied is an elastic metal chamber, at the base of which is a porous tile, through which the diffusion takes place. When the indicator is placed in an atmosphere containing coal gas, the hydrogen of the latter diffuses through the porous tile into the elastic metal chamber quicker than the nitrogen of the air can pass out; the velocities being in the proportion of 1 to 14. A pressure is caused in the metal chamber, and the movement of the elastic metal is transmitted by suitable mechanism to an index pointer, which moves over a dial marked to show percentage of gas present. A tap and valve are provided which communicate with the metal chamber, so that the coal gas may be let out after a test has been made; the tap and valve always being left open when the instrument is out of action.

To make a test, a hole is drilled down below the level of the main, and in close proximity, by means of a crowbar. Then a ring of clay or similar material is placed round the top, so as to allow the whole of the porous tile access to any gas which may be escaping. The smallest quantity will be registered quickly; the maximum effect being obtained within two or three

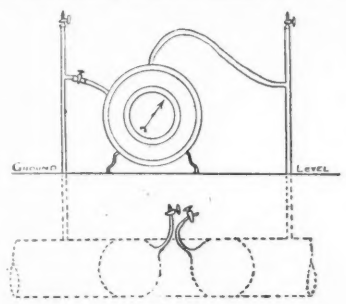


Fig. 1.

minutes. This process is repeated along the line of main until the maximum percentage of leakage is registered, and at this place excavation for repairs is made.

To test for the quantity of leakage in a main 200 yards long, supplying 50 consumers, and connected at both ends, a simple arrangement is shown in fig. 1. This consists of a test-meter connected by flexible tubing to ½-inch standpipes. All the service cocks are closed; consumers having previously been notified of the proposed test. The main is then securely bagged off at each end, and the test-meter is attached. The meter is usually of the wet type, provided with a circular spirit level, levelling screws, &c., and indicating the consumption per hour by observations of one minute.

To make a test, the inlet tap to the meter is turned on, and the index hand of the meter moves rapidly round until the "dead" portion of the main is completely filled with gas. If the index hand afterwards moves, there is a leakage in the main according to the amount registered on the dial. A number of observations should be taken, with a short interval between each.

1. (B) Describe fully the operation of temporarily stopping the leakage from a split 8-inch main; permanent repairs being impossible for some days.

To temporarily repair a broken 8-inch main, the pipe should be thoroughly cleaned on each side of the fracture. A band of thin sheet lead is then well smeared with white or red lead and placed over the fracture, being kept in position by strong copper wire. It is also advisable, if the temporary repair has to stand a day or two, to place round the sheet lead two clips made of flat iron, each in two sections, bolted together. If sheet lead is not obtainable, strong calico or sacking should be used. This should be well smeared with red or white lead and wrapped round the gas-main two or three times; each

wrapping in turn being smeared with red or white lead. The whole is then bound together with strong cord.

In case of a cracked socket, the crack must be filled in with iron cement or red lead.

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2. A five-light wet meter brought from a consumer's premises is found to be registering 25 per cent. slow. To what causes may this be ascribed? How would you proceed to put the meter into a thoroughly satisfactory condition, and certify the result of the work by testing on completion?

Causes.—1. Metal float, spindle, or plug sticking, in which case, if the water-line falls very low, the supply of gas is not shut off. It is improbable, however, that the water line would get so low as to cause a 25 per cent. slow registration unless water was leaking from the meter. 2. Meter worked above its normal capacity. 3. Breakdown of registering mechanism. 4. Drum working against a large amount of friction causing slow revolution. 5. Faulty drum—*i.e.*, holes, &c., in case.

Repairs.—The drum should be removed, thoroughly examined, and cleaned by immersing in soda and water. Small perforations may be found in the drum; and if so, they must be soldered up. Any rust or corrosion must be removed and the interior of the meter washed out with soda and water. The metal float and valve should also be inspected and, if necessary, put into proper working condition. If the drum is not repairable, a new drum, with compensating arrangement attached, should be substituted. The registering mechanism should next be examined, to see that all the wheels are in good working order, that no teeth, &c., are missing from the wheels, and faulty wheels (if any) replaced. The parts of the meter should then be carefully put together; the joints in the outer case being made with a mixture of red and white lead, and tested for soundness and accuracy.

Testing.—Place the meter on a level bench and fill with water. Connect the inlet to the gas supply and the outlet to a line of gas-burners, which are then lighted. When all the air has been expelled from the meter and pipes, the lights are regulated until 1 cubic foot per hour is passing, and the joints tested for soundness by a mixture of soap and water. A gas pressure of not less than 3 inches should be used for this test. Gas is then passed from a graduated test holder (say) of 5½ cubic feet or 11 cubic feet capacity at a constant pressure of ½-inch of water. When the small dial on the meter has reached a definite point and the holder has been adjusted to a convenient mark, gas is passed through the meter and burned at the float of lights. After passing 5 or 10 cubic feet, the readings of the holder and meter are compared, and the discrepancy (if any) noted. The percentage error can be easily calculated, and must not exceed 2 per cent. fast or 3 per cent. slow, after correcting for temperature and barometric pressure, to comply with the Sales of Gas Act.

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3. State, in percentages, the composition of the following alloys and the influence which each component has upon the finished alloy: Brass, gun metal or bronze, solder. In what way are two pieces of composition (lead) pipe joined by means of a blow pipe, and what precautions have to be observed?

The composition of ordinary yellow brass is 2 parts of copper to 1 of zinc; hard brass for bearings, 8 parts of copper to 1 of zinc—*i.e.*, in general engineering practice it varies from 2 to 8 parts of copper to 1 of zinc. If the copper is in a greater proportion than 4 to 1, the brass has a reddish appearance; while if less than 3 to 1, the brass appears to be more like zinc. Brass is tough. The quantity of zinc determines the degree of fusibility of the brass—the greater the zinc content, the more fusible the alloy. Bronze is an alloy of copper and tin, usually composed of about 9 parts of copper to 1 of tin (sometimes containing a little zinc). Hard gun metal contains 5 parts of copper to 1 of tin; soft, about 16 parts of copper to 1 of tin. The percentage of tin determines the hardness of the alloy.

Solders may be divided into "hard" and "soft" kinds, and are all composed of lead and tin.

Fine solder, 2 parts tin 1 part lead. Fuses at 340° Fahr.

Fine solder, 1½ parts tin 1 part lead. Fuses at 334° Fahr.

Coarse solder, 1 part tin 3 parts lead. Fuses at 482° Fahr.

Plumbers' fine, 1 part tin 1 part lead. Fuses at 370° Fahr.

Note: The coarse solder is of the "hard" type; the others being of the "soft" kind. More tin increases the quality of the solder,

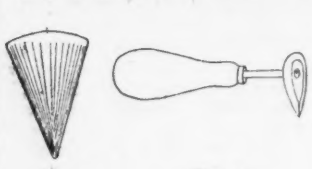

Fig. 2. Fig. 3. Fig. 4.

and also lowers the melting point. When a solder contains a large proportion of lead, the alloy is coarse and requires a high temperature for fusing. A good solder will emit a "crackling" noise on being bent.

To join two pieces of compo pipe together, one end is funnelled out by means of a tan pin (fig. 2), so that the other piece will just fit into it and leave a small groove to make the joint. The inside of the funnelled end is cleaned, and the top edge cut off cleanly with a shave hook (fig. 3). The other end to be inserted is then carefully cleaned by scraping to a depth of ½-inch; the lower end being slightly bevelled. This end is then forced into the opened one until the joint is firm enough to remain unsupported. A little powdered resin and oil is then placed in the space between the pieces of pipe to act as a flux. A spirit torch is lighted and the flame directed slightly above the joint by means of the blow-pipe. A stick of solder is held in the flame, also against the joint; the solder and flame being worked round until the union is complete. The joint is finally cleaned with tallow and cloth.

When making a joint with solder, it is essential that the surfaces of the component parts shall be perfectly cleaned by fluxes and free from metallic oxides. Such fluxes are zinc chloride, resin, or sal ammoniac, which prevent oxidation of metals when heated. The flame must not be allowed to play on any portion of the joint too long, as this would involve risk of melting the pipe. Must not get the joint too hot, or the solder may run into the pipe, and block it up. Care must be taken to work out any air-bubbles in the solder.

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4 (A). Why is it desirable to have pressures at consumers' premises regulated? Describe, with the aid of a sketch, one form of house service governor.

It is necessary to have the pressure regulated at consumers' premises because of the variation at which gas is supplied, and because of the variation in quantity demanded at different times. Uniformity of pressure is especially desirable for inverted burners. Other reasons are the prevention of waste of gas and breaking of mantles.

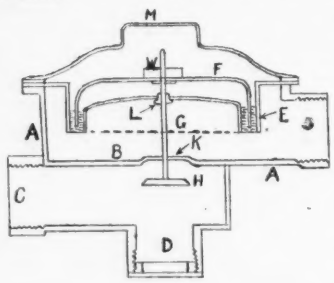

Fig. 5.

Fig. 5 is a sketch of a Peebles consumer's governor, which consists of an outer cast-iron casing A, which is divided into two chambers (inlet and outlet) by the partition B. The inlet connection can be made at either C or D, whichever seems most adaptable to the fittings. E is an annular mercury cup firmly secured to the main casting. In this cup, the bell F is free to rise and fall sensitively to the variation of demand. To the underside of the bell is attached a spindle G, which works through a brass guiding sleeve L in the top of the mercury cup. This spindle carries a flat disc valve H, which fits into the seating K, by which the gas-orifice can be increased or diminished. The spindle is made to project through the bell for the purpose of attaching weights W to regulate to the necessary pressure. M is a cast-iron cover to fit on to the casing enclosing the whole.

The action of the governor is as follows: The gas enters the inlet chamber at C or D and passes between the valve H and seating K into the outlet chamber. If, however, the pressure is greater than is required, weights are taken off the bell; thus allowing the spindle G to rise and decrease the size of the inlet orifice. Different weights are tried until the desired pressure is obtaiend. Then the governor automatically opens and closes the valve-way, according as more or less gas is required, but always maintains it at the same pressure.

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4 (B). How would you proceed to prove the presence of leakage in the fittings of a consumer; the leakage being too small to be readily indicated by the index of the meter?

An excellent method for proving the existence of a very minute leakage in a consumer's fittings is by the use of Milne's "Reliable" leak-testing machine.

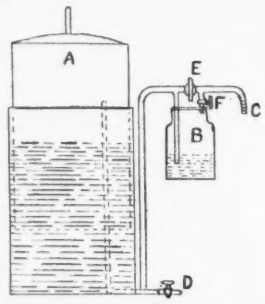

Fig. 6.

This consists of a small holder A, floating in an annular copper tank of water. B is a small glass bottle, half filled with water, to which are connected two tubes—one just slightly sealed in water, and the other unsealed and having a tap on it. These tubes are branched, one on each side of the tap E, on the main pipe leading into the bell of the holder. To operate it, connect the pipe C with india-rubber tubing to some part of the fittings. Turn off all taps on the fittings, also the meter-tap, and then open the tap D and draw up the bell. When nearly full of air, close the tap D, weight the bell, and open the tap E; thus allowing the pressure in the bell on the fittings. When the bell has become steady, close the tap E and open the tap F on the small tube, then the only connection between the fittings and the bell is through the water. Thus, if the pressure in the fittings falls, through a leakage, the pressure in the holder will then be greater, and will thus overcome the slight seal in the bottle, and bubbles of air will be seen to pass in this way. The machine is so sensitive that a leakage of 1 cubic foot in 350 hours is easily revealed.

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5. A room with 2000 cubic feet of air space is lit with one inverted burner consuming 3 cubic feet of gas per hour. What quantity of air will be required for combustion, and what will be the proportion, by volume, of its chief constituents? Assuming the air of a room is changed twice per hour, what percentage will the air required by the burner bear to the total quantity passing through the room?

The quantity of air required for the combustion of 1 cubic foot of gas varies slightly with the varying composition of coal gas from 5·5 cubic feet to 5·7 cubic feet. Therefore, taking the mean as 5·6 cubic feet of air for 1 cubic foot of coal gas, the quantity required for 3 cubic feet of coal gas will be $3 \times 5{\cdot}6$—*i.e.*, 16·8 cubic feet.

The proportion by volume of the chief constituents of the air are: Oxygen, 21 per cent.; nitrogen, 79 per cent.

If the air of the room is changed twice per hour or once in 30 minutes, then the volume $2000 \times 2 = 4000$ cubic feet, which will have passed through the room. The percentage of air required by the burner to the amount of air passing through the room is

$$\frac{100 \times 16{\cdot}8}{4000} \text{ equals } 0{\cdot}42 \text{ per cent.}$$

(To be Continued.)

THE GAS-TURBINE.*

It would be impossible to do anything but commend this excellent treatise on the theoretical and practical position of the gas-turbine at the present day. All that is important in connection with this fascinating subject has been grouped together to render the work both useful and instructive.

The object of this book is to compile in one volume the results of the work of English, French, German, and other organizations, so as to enable engineers, who are at present investigating the subject, to appreciate how much work has already been done, and so save unnecessary repetition—the frequent cause of much waste of time in all matters of research. One has only to consider the present position of steam-turbines in order to realize how highly desirable it is that the gas-turbine should meet with successful development to a similar extent.

In his first chapter, the author traces the evolution of the earliest forms of motors rotated by heat, from the smoke jack, actuated by fire, to the Stolze hot-air turbine, and the later turbines of De Laval and Lemale. A great deal of space, but none too much, is devoted to the reproduction of a paper on "A Scientific Investigation into the Possibilities of Gas-Turbines" read by Mr. R. M. Neilson before the Institution of Mechanical Engineers in 1904, and the highly-important discussion, contributed to by the most experienced engineers on the subject of turbines, which followed the reading of the paper. Much information is contained in a paper read by M. Sekutowicz before the Society of Civil Engineers of France, to which are devoted a couple of chapters.

So many difficulties lie in the way of a successful issue to the attempts to bring the gas-turbine from the experimental to the practical stage, that readers of Mr. Suplee's book will possibly consider that the author is somewhat unduly optimistic. Of these difficulties the question of temperature, during working, of the material of which the turbine is composed is by no means the least. When it is considered that the temperature at which the material forming the turbine must necessarily be maintained while at work far exceeds the fusing point of iron, steel, and copper, it will be seen the task before experimentalists is no light one.

The problem before the pioneers of the steam-turbine was by no means so abstruse; for in this case the temperature of the working fluid does not exceed that at which the ordinary and most suitable metals practically retain their full strength. There is, however, no need to be too pessimistic of the prospects before the gas turbine; for, as the author points out, "there are many active and energetic minds at work on the problem, and commercial results may soon be expected to follow;" though Mr. Dugald Clerk, in the discussion on Mr. Neilson's paper, said that "he did not see any immediate future for a gas-turbine, except in possibly utilizing exhaust gases from reciprocating engines, which at present were liberated under considerable pressures."

The last chapter, on the "Practical Work of Armengaud and Lemale," is most enlightening, and demonstrates to the reader that the progress in gas-turbines has been by no means illusory. It is stated that a number of 120-H.P. gas-turbines of a special type have been actually installed in submarine torpedoes completed for active service. These turbines travel at a speed of 1500 revolutions per minute; and yet the total weight is only 162 lbs. There is also described a small gas-turbine, built by Karasodine, operating with regularity and success. Developing about 2-H.P., its speed is no less than 10,000 revolutions a minute; while the diameter of the turbine is only 6 inches. As the author points out, the continuous turning effort is often most desirable; and taking into consideration the small size, the possibilities of such an apparatus become evident.

The subject is very capably treated, and the work of the author cannot but assist in the practical development of a type of engine which may well, in the future, bring much grist to the mill of the gas engineer. The book may be thoroughly recommended.

* "The Gas-Turbine." By H. H. Suplee. London: Chas. Griffin and Co., Limited; 1910. [Price 12s. 6d. net].

French Gas and Electricity Undertakings.—We have received from the offices of the "Journal de l'Éclairage au Gaz et à l'Electricité," 7, Rue Geoffroy-Marie, Paris, the directory of gas and electricity undertakings which, for about fifteen years, has been issued under the supervision of M. Maurice Germain, the Editor of the above-named publication. The edition for the present year has, of course, been revised and brought up to date. In the section relating to gas will be found a complete list of gas-works, particulars of the localities served from them, the names of the officials, &c., and a list of gas-fitters. The portion devoted to electricity furnishes a large amount of information in regard to undertakings supplying this illuminant; and there is a list of towns possessing a system of electric tramways. Each section of the book contains a chapter giving the names of the larger gas and electricity companies, with the amount of capital, the official address, the names of the directors, and the number of works owned; together with lists of suppliers of plant in connection with both of these industries. The work is now well established; and every effort has been made to ensure for the present edition the same success which has attended the issue of its predecessors. The price of the book is 4 frs. in other countries than France.

KÖNIGSBERG GAS-WORKS.

[*Continued from p. 957 of last week's issue.*]

The Meter and Governor Room.

This room contains a wet station meter of 81,190 cubic feet per hour capacity and two district pressure regulators, with 30-inch connections, and a bye-pass with relief governor between the meter inlet and the district main. The floor on which the meter and governor stand is about 10 ft. 6 in. above the ground level. The apparatus is supported at this height on an iron structure, while the whole building rests on brick foundations and a pile framing. The connections under the floor of the governor-room are so arranged that gas can be passed if required direct from the purifiers to the governors; while there is a bye-pass for the station meter and a connection with a valve between the inlet and outlet of the gasholders. With a view to subsequent extensions, the main leading from the station meter to the inlet to the gasholders is 30 to 44 inches in diameter; the outlet main from the gasholder is 44 inches in diameter; and the main leading to the district pressure regulators is the same size.

Gasholders.

The inlet and outlet mains, consisting of wrought-iron pipes 44 inches in diameter, are carried from the governor-house to the gasholders at a height of 16 feet above the ground level—measuring from the under side of the mains. They enter a valve-house situated between the two gasholder tanks, and there branch to the two holders. The branches are laid underground. The tanks of the gasholders are annular, and stand on annular foundations which rest above ground on brickwork which, under ground, is carried by granite concrete supported by a ring-shaped foundation of numerous piles, securely tied together. These piles are 52 ft. 6 in. to 56 ft. in length. The horizontal roof of the tank is partly carried by the iron tank and partly by a column. It has ribs with flexible joints. The interior of the tank is used as a store for iron and fire-clay goods. A steam-pipe runs through the annular brick foundation; and from it four branches are carried to the rim of the tank. They feed six injectors for heating the water in the tank and four injectors for heating the water in the cup of the No. 1 gasholder, which is telescopic. The steam connection between the fixed steam-pipes and the cup is by means of metallic flexible tubing, which runs over a roller carried by the rising and falling gasholder, so that the length of tube remains constant in all positions. The gasholder bells have man-holes and dip-pipes over the inlet and outlet mains, so that access can be obtained to the mains without entirely grounding the bell or emptying the gas from it. This arrangement has proved of practical value; as, after nine years' working, it became necessary to clear the outlet main of the telescopic holder of accumulated naphthalene.

Liquor Distillation Plant.

To the north of the condenser and washer building is a simple massive brick building, of 2153 square feet area, containing the liquor distillation plant. There are two column stills capable of dealing with 2206 and 4412 gallons respectively per diem of crude liquor. The smaller still was brought from the old works. The concentrated liquor is stored in a wrought-iron cylindrical tank, from which it is pumped by means of an air-pump into the tank waggons which are run along the north front of the building. There are also in the same building two boilers and a press for boiling and filter-pressing cyanogen sludge. The ammonia liberated in the boiling is recovered in a small condenser as concentrated liquor. The filtrate from the presses is worked up to sulphate of ammonia. The lime sludge from the stills is collected in a pit in the basement of the building, having a partition to facilitate the separation of the water, which is run off into the sludge catch-pit in the water-tower.

The Water-Tower.

The water required on the works is taken from the River Pregel. A storage tank of about 700,000 gallons capacity is installed in a water-tower to the west of the liquor distillation house. Having regard to the small area of this tower and the weight of it and its contents, it was a specially difficult matter to secure a sufficiently firm foundation. A framing of piles, nearly 40 feet in length, was adopted; and the tower stands on it on an annular concrete base. The hollow space within the concrete base is used for a tank which is divided by two radial partition walls. One-half is used as a sludge catch-pit and the other as a tar-tank. The tower is carried up to a height of about 43 feet above the ground, where it is covered with a tiled roof; but out of the latter extends an iron framing, having the shape of a truncated cone, which carries the wrought-iron elevated tank for the river water. The bottom of the tank is of the Intze type of construction.

Immediately below the roof of the main portion of the tower is an annular concrete tank of a capacity of 35,300 gallons, which is for the storage of drinking water, as a reserve in case of any interruption of the drinking water supply to the works, which ordinarily is taken from the town mains. Directly underneath this is an annular tank of 353,000 gallons capacity, which is used as a tar-tank. A pipe with provision for steam-heating passes from the tar-tank to the outside of the tower, where it terminates

in a valve directly above the railway line, so that tank waggons can be filled through it. Beneath the tar-tank, at a height of 18 feet above the basement, is an intermediate floor available for stores. The basement is used for the storage of sulphate of ammonia and for the accommodation of the requisite pumps.

Water-Gas Plant and Boiler-House.

In anticipation of a third retort-house being required, a third pile-framing foundation was put in; and at the east end of this the water-gas plant and relief gasholder from the old works were erected in 1903. The building is iron-framed, with cement and wire-lattice walls. An electro-motor is used for driving the fan. A station meter from the old works is used for measuring the water gas. The generators have been refitted with valves with safety interlocking gear. An improved dust separator was attached to each generator; and the scrubbing capacity was increased by the provision of a second scrubber and extending the height of the former scrubber. The uncarburetted water gas made was at first passed experimentally into the retorts, but later through the dip-pipes into the hydraulic mains of the retort-benches.

The boiler-house is attached to the liquor distillation house. It contains in the first instance two water-tube boilers of the Babcock and Wilcox type, each of 3230 square feet heating surface and 646 square feet superheating surface. The boilers produce steam of 8 atmospheres pressure with 250° to 300° superheating. They are heated with coke breeze; and the flue gases are drawn by means of Sturtevant fans into an iron chimney on the north side of the house. The fans will produce a draught of 14-10ths. Two steam-mains pass from the boilers through the washer-house to the retort-houses and water-gas plant. One steam-pipe is carried through the liquor distillation house to the water-tower, and so to the purifier-house, governor-room, and the gasholders. Another pipe goes to the baths and kitchens.

Technical Development of the New Gas-Works.

As already described, provision was made for the erection of a third retort-house by putting in the foundations, which were, however, made use of for the time being for the water-gas plant from the old works. By the year 1905, the maximum daily output of the existing retort-house plant had been overtaken by the consumption. Experiences elsewhere, however, indicated that it would not be desirable to extend the retort-house plant, according to the old designs, with inclined retorts. In order to secure time for consideration of the new types of carbonizing plant which were being introduced, recourse was had to the plan of increasing the productive capacity of the works by the addition of water gas. Up to this time, water gas had been introduced into the hydraulic main, and thus a sufficiently uniform and satisfactory working had been obtained without artificially carburetting the water gas. Further increase of the make of water gas, however, necessitated carburetting. The altered market conditions, and the position of the new gas-works, pointed to the production of water gas carburetted with oil being most economical. All the apparatus of the old plant, with the exception of the generators and the fans, was therefore done away with, and on the space thus rendered available a water-gas generator, with carburettor and superheater for a productive capacity of 35,000 cubic feet per hour, was erected. The apparatus was arranged so that the generator could be used if desired by short-circuiting the carburettor and superheater for the production of blue water gas. A "Standard" washer-scrubber from the old gas-works was erected for scrubbing the water gas. The oil-tank was constructed within the relief gasholder.

Coal-Conveying Plant.

The new coal-conveying plant came into use in 1906. Owing to its geographical position, Königsberg depends on England for its coal supply. The channel from the Baltic Sea to the River Pregel at Königsberg was deepened in 1902 to admit of large sea-going vessels coming up to Königsberg. The gas-works is, therefore, supplied direct with coal from the steamers. But the supply may be cut off for four months of the year by ice. Hence two adjacent halls, having an area of about 68,900 square feet, were erected as coal-stores. On the river foreshore, two travelling tower cranes were installed with grabs of 1 to 1½ tons capacity. The grabs and cranes are worked from an engine box on the tower by means of electric winding gear. The coal arrives in steamers of 2000 to 5000 tons capacity, having usually three or four hatches. The grabs fill themselves automatically in the holds of the boats, and are then run up and discharged into a receiver, the lumps passing over a screen to the coal-breaker, from which a load-measuring vessel is filled. This vessel fills in turn the waggons on a rope-line which runs to the coal-store. The waggons pass over an automatic weighing machine as they leave the coal unloading berth. In each of the coal halls are two electrically driven travelling cranes of about 130 feet span. The cranes travel on lines running along the sides of the halls. The two cranes are coupled to a travelling line, about 260 feet in length, which traverses the two halls, and carries an inclined plane which can be hooked by means of sliding tongues on the rope of the rope-line. On the travelling cranes there are, at short distances, shifting lugs by which the waggons of the rope-line are tipped. The waggons on the rope-line are impelled to the sheds, therefore, only by *vis viva* on the inclined railways. An elevator is provided at the south-east corner of the coal-store for raising coal from railway waggons to the rope-line if required. For removing coal from the store, there is a travelling crane, with grabs in both halls. The filled grab conveys the coal to the middle gangway of the two halls, where it is discharged into the receiver of a rope-line conveyor, by which it is taken to the retort-houses. Provision is also made, by means of the rope-line, for conveying coal direct from the steamers to a receiver, from which it is transferred to the retort-house conveying lines.

Additional Apparatus.

In 1906, the purifying plant was extended by the addition of two vessels of 689 square feet area of grids. This brought the number up to six vessels, which are worked in two sets of three. The station gas-meter being no longer sufficiently large was supplemented by the installation of a dry rotary meter of a capacity of 105,000 cubic feet per hour (made by the Rotary Meter Company, of Manchester). A third exhauster of 175,000 cubic feet capacity per hour was added in 1907. In 1908, a third boiler of 3230 square feet heating surface was erected in the boiler-house; and in the same year the extension of the carbonizing plant was put in hand. After due consideration of the modern types of carbonizers, it was decided, on the ground of low depreciation charges and high productive capacity, to erect two inclined chamber settings each containing four carbonizing chambers for a charge of 6½ tons. In 1909, this installation was enlarged by the addition of four more settings of four chambers each. A view of the discharging side of these chambers was given in last week's issue, and a detailed description of them was published in the "Journal," Vol. CVIII., p. 109. A comprehensive statement of the working results cannot be given here; but, speaking generally, it may be said that a considerable advance in the yield of gas has been undoubtedly obtained by the use of this plant.

In January last a third washer was erected primarily for the extraction of ammonia; but it was so arranged that it could be used if required for the extraction of cyanogen from gas which had been previously freed from ammonia. The rapid development in the output of gas showed that the provision made in the scheme for the new works for washing and purifying plant would soon be inadequate. The make of gas had nearly doubled between the years 1902 and 1909; and in the latter year a maximum daily make of 3,378,000 cubic feet was attained. The new works was intended for apparatus for a maximum daily make of about 7 million cubic feet. In order to avoid as far as might be the construction of new apparatus houses, and to work on as low a capital outlay as possible, an attempt was made to solve the following problems: (1) To make the recovery of ammonia from the crude gas independent of the temperature of the washing water and of the gas; (2) to introduce a cheap process for the production of sulphate of ammonia, as hitherto concentrated liquor only had been sold; (3) to effect the economical recovery of cyanogen; and (4) to diminish the space required for sulphur purification. Study of these questions led (in 1907) to a contract being concluded with a Zehlendorf Company, by which that Company erected on the gas-works, at their own cost and risk, a washing plant of about 4 million cubic feet capacity per diem. This plant was to test the applicability of the different processes devised by Herr Walther Feld. Trials were made of it at the end of 1908 and the beginning of 1909; and, as a consequence of the results obtained, the installation was modified and is now again at work. The course pursued is as follows: The crude gas is freed from tar as hitherto; and then sulphur and ammonia are extracted from it by means of sulphurous acid. Then it is treated with a solution of sulphate of iron or zinc, which solution is regenerated by means of sulphurous acid and air. In the regeneration, sulphur is precipitated, and is used again for the preparation of the sulphurous acid required. The procedure is therefore: Firstly, complete recovery of ammonia as sulphate, independently of the temperature of the gas and without the purchase of sulphuric acid; secondly, the limitation of the dry purification for sulphuretted hydrogen to a small portion of the sulphuretted hydrogen contained in the crude gas; and, thirdly, economy of space through the use of rotary washers with vertical axes. The gas thus freed from ammonia is then purified from cyanogen; and the rest of the sulphuretted hydrogen, which was not taken up in the ammonia washers, is passed into the dry purifiers.

The distributing system was enlarged owing to a number of suburbs being taken into the municipal area on April 1, 1905. In the summer of that year gas-mains were extended to these suburbs, and public lighting was introduced there. In 1907, a special main, of 14-inches diameter, was laid to the north-west suburb of Amalienau. At the end of the year 1908, the distributing system had a length of 83 miles of main, and there were 3935 public lamps, of which 1900 were provided with distance-lighting apparatus actuated by increased pressure from the gas-works. The extension of the distributing system in 1906 included the laying of two mains, of 26-inches diameter, beneath the River Pregel. The length under the river bed was about 360 feet.

(To be continued.)

We have received from the Council of the Scottish Junior Gas Association (Western District) the "Transactions" for the past session, as reprinted from the "Journal." Seven papers were read; and there were four visits to works. The subjects dealt with were full of interest; and the Council, in their report, say that the attendance of members at all the meetings was well maintained. There is an index to the papers; and at the end of the pamphlet is a list of the office bearers and members.

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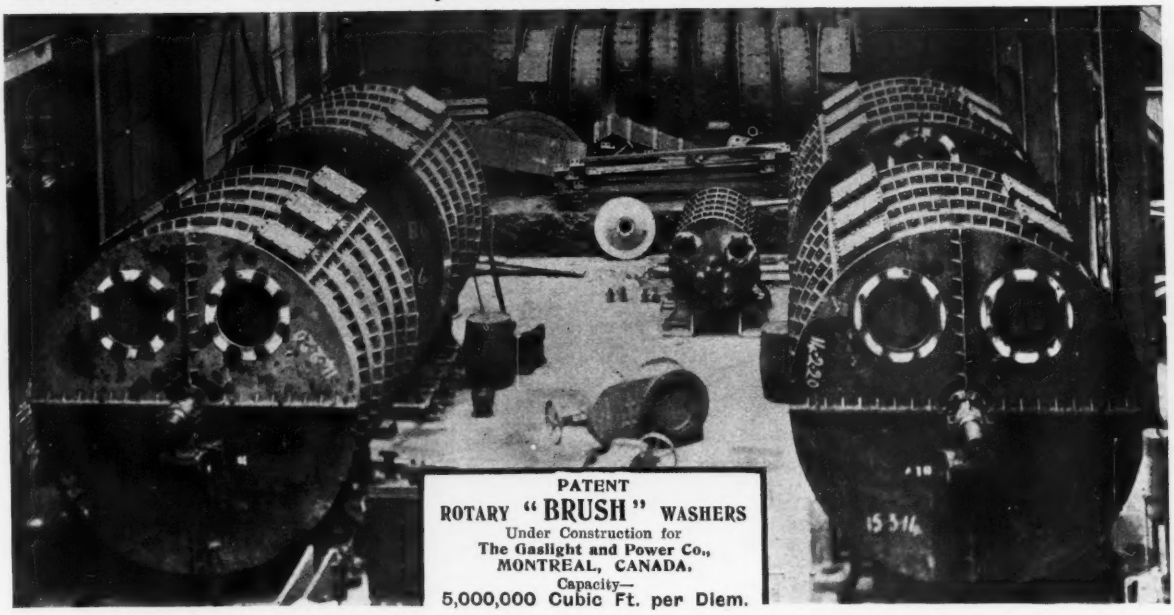

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GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

The Report and Accounts for the Year 1909-10.

The report of the Council of this Association, presented at the annual meeting at Königsberg on the 20th to the 24th ult., refers first to the celebration last year of the jubilee of the Association, and the success of the general meeting held at Frankfort-on-the Main in connection therewith. The album issued in commemoration of the completion of fifty years' activity has already been reviewed in our columns [Vol. CVII., p. 169]. The report states that it has been very widely circulated among public authorities, colleges, and other bodies to which it was likely to be of interest, and has been received with most favourable comments.

Reference is next made to the election last year to honorary membership of the Association of Dr. Hans Bunte and Herr W. von Oechelhaeuser, to whom illuminated scrolls recording the election were presented at Carlsruhe and Dessau on Dec. 18 and Feb. 20 last respectively. The Bunsen-Pettenkofer Medallion of Honour was conferred on Mr. W. H. Lindley, of Frankfort, in recognition of his distinguished work in connection with water supply in Germany and abroad, and the great services which he has rendered to the Association, especially through the various Technical Committees on which he has served. The same distinction has been conferred also on the chiefs of two firms of makers of gas plant and apparatus—Dr. E. Blum, of the Berlin-Anhalt Engineering Company, and Dr. R. Pintsch, of the firm of that name.

In recognition of the changing conditions of the gas industry, and to counteract the favour shown by municipal authorities and others to electricity, it was decided, at a meeting held on March 14 last at Berlin, to found an Organization for Promoting the Sale of Gas. The Council decided on April 8 to support this organization by an annual contribution to it from the Association's funds of £250 (which decision was confirmed by the general meeting at Königsberg). The Council have lodged a protest with the Secretary of State for the Interior against a new German law for facilitating the distribution of high-tension electricity. Another protest has been sent to the Ministers of the Interior, of Commerce, and of Public Works against the favour shown to electric lighting for warehouses, concert-rooms, and theatres by the regulations of the Chief of Police of Berlin. In order to bring home to consumers and others the great industrial importance of the gas industry and its progress in recent years, the Association have started on the compilation of industrial statistics relating to the last three years, and many valuable conclusions have been already obtained therefrom; but the full results are not yet ready. The Council and the Technical Committees of the Association have also given much attention to the question of spreading knowledge in regard to the use of gas and its wide applicability, by means of lectures, &c.; and it is hoped that, through steps taken by the German Continental Gas Company, a greater number of properly qualified lecturers and instructors will be available shortly for this work. The Association are acting jointly with the new Organization for Promoting the Sale of Gas in endeavouring to secure ample space for exhibits relating to gas and water supply at the International Exhibition of Hygiene which is to be held in Dresden next year; and as the meeting of the Association will be held in that city, members will then have a good opportunity of seeing the results of the work done to organize the gas and water exhibits.

The report next refers to the arrangements which had been made in the spring for the visit of members of the Association to England in the second week after Whitsuntide, for a tour of inspection of the gas-works in London, Edinburgh, and Glasgow, and to the postponement, in consequence of the death of King Edward, of the visit to about the end of September, when it is hoped a large number of members will participate in the tour.

The proposal emanating from England, America, and France for the adoption of an international unit of light based on comparative measurements of the standards of light in common use in the different countries was considered by the Council. While believing that Germany has in the Hefner lamp the unit of light which has been proved to be the best available for practical photometry, the Association, acting in unison with the Union of German Electricians, have deemed it inexpedient for the time being to raise objection to the proposed international candle, provided its ratio to the Hefner unit is exactly determined. It was considered that such an international unit of light should have a rational basis, and be sharply definable and reproducible, as is the case with the Hefner unit at the present time. But so long as the units and methods employed in photometry differ as greatly as they do now, conversion of experimental results by calculation cannot be avoided; and hence the creation of an international unit does not seem to the Council to be very pressing. The Association and the Union of Electricians have in the meantime addressed a petition to the Imperial Office for the Interior, asking the assistance of the German Government and the Imperial Physical-Technical Institute in work directed towards the creation of a rational unit of light having a scientific basis. The Minister of the Interior has sanctioned the investigation of the question by the Physical-Technical Institute; and his subsequent action will depend on the results of this investigation. No substantial progress since last year has to be reported in the endeavour to create an international gas screw-thread.

The Council record their thanks to the members of the various Technical Committees of the Association for their labours. The thirtieth of the annual volumes of gas statistics compiled under the auspices of the Association relates to the year 1908, and embodies several alterations in the information furnished as compared with the earlier volumes. Questions now dealt with in the statistics include the number of settings and the number and type of the retorts or chambers in use, the production and use of water gas, and particulars of long-distance gas supplies and high-power gas lighting. The statistics now relate to 287 gas undertakings, as compared with 273 in the previous year. A considerable increase in the consumption of gas is generally shown, though it is not quite so great as in the previous year. It is intended to make a more comprehensive volume of statistics once every five years; and the first of such volumes is that which is now in the press.

The number of members of all classes of the Association has increased by twelve in the course of the year, and now amounts to 1107.

The report next refers to the eight District Gas and Water Associations which are affiliated to the German Association, and gives particulars of their membership and the meetings which they have held during the past year. Then a list is given of contributors to the fund for furthering the scientific work of the Association, and to grants made from the funds of the Schiele Foundation to students and for research work. The Benevolent fund of the Association dispensed during the year about £332 to 29 families or persons.

The report states that Mr. W. H. Lindley, of Frankfort, retires this year from the Council, and is not eligible for re-election. [Herr H. Ries, Manager of the Munich Gas-Works, was chosen by the general meeting at Königsberg to succeed him.]

The accounts show receipts for the year amounting to about £2028, and a sum brought forward of £924. The ordinary expenditure amounts to £1770; and there is an item of £914 of extraordinary expenditure towards the Instructional and Experimental Works at Carlsruhe. The book-value of these works now is about £2262.

Reports of the Technical Committees.

The Heating Committee.

The draft set of prescriptions and rules for the sale, regulation, and use of gas brought forward by the Committee at last year's meeting ["Journal," Vol. CVI., p. 971] was, in so far as its second section—viz., "Rules for Fitting Work"—was concerned, submitted to the German District Gas Associations for their opinion and suggestions as to desirable alterations. The Committee now record their warmest thanks for the valuable hints received from these Associations.

In regard to technical questions, the proposals of the Committee could, generally speaking, be forthwith adopted. The Rhenish-Westphalian and Brandenburg Association, however, emphasized the point raised at the last meeting—viz., that under no circumstances must the supervision of fitting work be subject to the police authorities, even though the latter may only serve as a backing for the gas-works which will actually exercise the control. After much deliberation, the Committee finally came to an agreement that in all the circumstances the testing and control of gas-fitting work must be in the hands of the gas-works, and that the police authorities should be entirely excluded from the rules, in order especially to avoid collisions between them and the gas-works in cases where the latter undertake fitting work. The Committee was of opinion that fitting was to-day so important a branch of the activities of a gas undertaking that not only should all parts of the rules which gave the police any control be deleted, but that the introduction to the rules should be modified so as to express the importance of the fitting work now carried out by gas-works. In opposition to the idea that the authority of the police would be necessary to make the prescriptions effectual and to impose penalties for faulty fitting work, it was pointed out that the provision of the rules, that in cases in which the conditions were not fulfilled gas should not be supplied, was sufficient authority for refusing to make the connection with the main where the house installation was defective. Moreover, the prescriptions might be regarded as generally accepted rules in the building and decorating trade, and failure to comply with them would be an infraction of the common law and, as such, punishable by fine. In order to avoid risk of partiality in cases where the gas-works which acts as the controlling authority undertakes fitting work, provision has been made for appeal to some person who shall be independent of the gas-works. The question of provision for dealing with strikes of fitters might, the Committee thought, be allowed to stand over for a time. It was considered undesirable to put any restriction on the right of a fitter to undertake work in any district. A joint sitting of the Committee and representatives of the German Fitters' Union was held on March 12 at Frankfort; and while it was found impossible to conform to the views of the latter in all respects, it was decided to formulate them in an appendix to the report. The Committee consider that the rules, as now set out, are ready for the approval of the Association. They were approved by the general meeting at Königsberg.

The proposal of Herr Reichard, that the Committee should undertake to train lady instructors in gas cooking, has been met by the German Continental Gas Company placing their lady instructor at the disposal of other gas-works for lecturing purposes. Also the newly-formed "Organization for Promoting the Sale of Gas" [referred to in the report in last week's "JOURNAL" of the proceedings at the meeting of the German Association] has made a special point of stimulating gas cooking by lectures on the subject.

A new question, which has come before the Committee is the participation of the Association in the International Exhibition of Hygiene at Dresden in 1911. At a joint meeting of this Committee and the Water-Works Committee held at Frankfort on March 13 last, it was decided that it was desirable that the Association should participate, and a special Sub-Committee was appointed to report on the arrangements which could be made. This Sub-Committee has recommended that a special pavilion should be secured at the Exhibition for the gas and water industries, with a view particularly to displaying their hygienic and scientific aspects. The steps taken by the General Secretary to obtain this have not yet reached any definite conclusion, and the financial support required cannot therefore yet be fixed.

The resignation by Herr L. Körting, one of the Honorary Members of the German Association, and until recently Manager of the Hanover works of the Imperial Continental Gas Association, of his seat on the Committee, has been accepted with much regret, and the retirement of Herr Galley from the Committee is also announced. The report is signed by Dr. E. Schilling, of Munich, as Chairman of the Committee.

The set of prescriptions and rules for the sale and use of gas, which have been referred to in the foregoing report, are printed as an Appendix to it. They cover 40 pages, and are divided into a preface and four sections, of which the first relates to the regulation of the relations between gas-works and consumers, the second to prescriptions for fitting-up houses and rules for gas-fitting, and the third constitutes a simple statement for the information of consumers on the properties and use of gas. The fourth section is supplementary to the second, and merely gives explanations and additions proposed after the latter had been drafted. It is unnecessary to refer in detail in the "JOURNAL" to the set of rules and prescriptions.

GAS-METER COMMITTEE.

This Committee report that they have not put any fresh work in hand, and that the investigations already started have been hampered through the many other claims on the time of their members individually. Consequently, the work of the Committee has not progressed so rapidly as might be wished. The artificially prepared membranes for dry meters, which had previously been made in small pieces for preliminary examination, have now been produced in larger sizes, and found to be as good as the small pieces formerly made. Experimental meters for 5 and 20 lights made up with these membranes are ready for distribution to the gas-works which have undertaken to submit them to supervised durability trials. The Committee have decided that these should be conducted as far as possible on a uniform basis.

The question of a reduction of the fees charged for stamping gas-meters has been further considered, and the President has agreed to present a petition to the Bundesrat urging the necessity of a reduction in the fees at present prescribed by resolution of that body. The Committee have continued their work aiming at the unification of the external dimensions of the gas-meters made by different firms. There seems little difficulty in arriving at uniformity in regard to wet meters; but the dry meters vary greatly, and the Committee are still in communication with the representatives of the firms of makers in regard to an agreement as to the dimensions. The question of meter unions and threads has also been considered; and the Committee recommend the adoption of the sizes approved for gas and water pipes by the Joint Standards Committee of the Association and of the Association of German Engineers in 1903.

The Committee had been asked to make trials of the "Rota" apparatus for measuring gas made by the Rota works at Aix-la-Chapelle. Several examples of it were supplied for an extended trial; and observations taken by two members of the Committee showed that while it was not applicable to the exact measurement of quantities of gas, it was useful for a number of other purposes, such as the rapid measurement of the gas consumption of lamps and apparatus, and for regulating gas-nipples, testing of meters *in situ*, determining the amount of gas passing through a pipe, and measuring the air for the revivification of oxide in the purifiers, and of gases generally for mixing.

The Committee record their thanks to the Imperial Standards Department for the interest which it has taken in the work of the Committee. The report is signed by Herr C. Kohn, of Frankfort-on-the-Main, who is the Chairman.

WATER-WORKS COMMITTEE.

The report of the Committee on the working of Water-Works states that they held two meetings. Reference is made to the publication of the twentieth issue of the "Water Statistics," compiled under the direction of the Committee. This contains reports from 381 undertakings, compared with 345 in the previous year's issue. It is the practice to include full particulars of the machinery and equipment of different works in every fifth year's volume, and the present issue contains this complete information. In other years only new plant is referred to. It was decided to include in the next volume information on many points not hitherto dealt with; and additional questions were accordingly drawn up for issue to the authorities concerned. A large number of answers have already been received. One question was as to whether any tests were made o the calorific power of the fuel used on the works; and 56 undertakings replied that they made such tests, while 298 replied that they did not. Another question was as to whether the manager had had any opportunity of seeing a water-diviner at work; and, if so, with what result. Only 24 answers were in the affirmative. The question of water-divination was discussed at one meeting; and the information obtained showed that the "art" was again in the ascendant. The Committee were unanimously of the opinion that the collection and sifting of particulars of cases of the use of the divining-rod and the publication of the results of this investigation would be the best means of correcting erroneous views thereon. Reference is made in the report to the joint meeting with the Heating Committee, called to consider the question of the participation of the Association in the International Exhibition of Hygiene at Dresden next year. The result of this meeting has been referred to in the report of the Heating Committee [*vide supra*]. The Committee deplore the loss by death during the year of Herr E. Kunath, one of the oldest members. The report is signed by Herr Reese (Dortmund), Chairman of the Committee.

ELECTROLYSIS COMMITTEE.

The report of this Committee for the year 1909-10 states that no independent work has been carried out, as for the time being the activity of the Committee is merged in the Electrolysis Committee appointed jointly by the Association with the Association of German Electricians and the Association of German Tramway and Light Railway Undertakings. The Joint Committee have already carried out investigations at Düsseldorf, on which a circumstantial report has been prepared. A Sub-Committee have been appointed to sift the immense mass of information collected by the Committee, and to draw up a set of prescriptions for general acceptance. Great difficulty, however, has been experienced in this matter, because the interests of the two principal parties in the Committee are opposed. Much time has been spent in collating the results of investigations carried out at Brunswick, Nuremberg, Cassel, Warsaw, Beuthen, and Düsseldorf. In fact, one engineer—viz., Herr Besig—has been almost exclusively engaged on this work up to the end of the year. The issue of the complete report has not therefore yet become possible. The prescriptions suggested by the Sub-Committee were, however, discussed in a plenary sitting of the Committee held at Carlsruhe on April 30 last, with the gratifying result that they were unanimously adopted, with but trifling alterations, and there is every prospect of their ultimate ratification by the three component Associations of the Joint Committee.

The "Prescriptions for the Protection of Gas and Water Pipes from Injurious Effects of Currents of Electric Lines using Continuous Current and the Rails as Conductors" are given in an appendix to the report. They are in six sections, of which the first refers to the range of applicability of the prescriptions, and excludes therefrom lines of which the rails are insulated by being laid on a wooden bed or the like, and lines which are at least 200 metres (656 feet) from the nearest point of the system of mains. The second section states that the rails used for conducting the current must be laid and maintained, as far as possible, as reliable and perfect conductors. The resistance at the joints must not be more than 20 per cent. higher than the resistance of the rail where there is no joint. All conductors for carrying current which are connected with the rails are to be insulated from earth. The third section refers to the tension in the rails, and states that in urban localities where the lines ramify the tension between any two points must not exceed 2½ volts, while on outlying stretches the fall of tension must not exceed 1 volt per kilometre. A higher tension may be allowed on lines which are only used for one or two hours a day. The fourth section relates to the resistance between the rails used for conducting current to earth, which resistance must be as high as possible and, if necessary, owing to special conditions of soil or otherwise, must be increased by effective insulation. The rails and conductors connected with them must not be connected with gas or water pipes or other metal bodies embedded in the earth. The distance between rails and hydrants, syphon-pots, or other objects lying near the surface and attached to the pipes by metallic connection must be at least 40 inches. Insulated conductors must be used for motors, lights, &c., fed from the tramway conductor except in certain specified exceptional circumstances.

The fifth section states that while the preceding prescriptions are intended to avoid the possibility of pipes being destroyed, it is recognized that the electrolytic destruction of pipes depends quantitatively on the density of the current passing from them. Where the current due to tramway currents has an average density exceeding 0·75 milliampere per square centimetre, the pipe or main is to be considered unreservedly as endangered by the tramway; and further protective measures must be taken. Exception is made for goods lines working only for a short period of the day. The sixth and last section gives the provisions which should be made for supervising installations, such as the carrying of test wires from junctions in the line to some central point, so that the potential at junctions may be readily tested.

The report points out that these prescriptions tally generally

with the regulations which the Association have considered necessary, though their outward form is different; and more latitude is given to the tramway constructors as to the choice of means by which the desired end may be attained. A few measures have, however, merely been recommended instead of being definitely prescribed. The prescriptions aim, on the one hand, at providing all the protection which is imperatively required, while not exceeding what is practicable in present conditions. To what extent they fulfil all requirements will be revealed by future experience only; and as a result of the latter, changes may have to be made. The Committee of the Association propose, as soon as the work of the Joint Committee is finished and their final report issued, to resume independent inquiries into the question of the electrolysis of gas and water mains by vagrant currents. The report is signed by Mr. W. H. Lindley, of Frankfort-on-the-Main, on behalf of himself and his colleagues.

The Instruction Committee.

The training schools for gas fitters, &c., referred to in previous reports, have continued their work regularly during the year 1909-10; and the Committee propose next year to reconsider the schemes of instruction and the results obtained at these schools. The Committee have been busy with the organization of instruction in gas cookery, and have decided to submit the following propositions to the Council of the Association: (1) That courses of training for ladies in cooking by gas be established in suitable centres in Germany, such as Berlin, Leipsic, Dresden, Carlsruhe, Wiesbaden, &c., if local conditions and the gas-works managers favour the scheme. (2) That it be ascertained through members of the Association what cookery schools exist in different places, and that gas apparatus be put at the disposal of these schools free of cost, and instruction be given there on cooking by gas. (3) That the ladies trained to give instruction be informed of the facilities offered by the gas-works for the supply, by hiring or otherwise, of gas cooking apparatus, and that they be requested to include this information in their course of instruction. (4) That in lectures and courses of instruction it be strongly recommended that explanation be given of the regulation of gas-burners, and the mode of dealing with any obstructions which may occur. (5) That in default of courses on gas cooking, which should be repeated frequently wherever possible, it is strongly recommended that suitable articles thereon should be inserted in the newspapers. (6) That it is desirable to ascertain and consider whether prepayment meters might not be introduced in many places solely for heating and cooking purposes. (7) That it is desirable to give attention to the supply of specially cheap gas cooking and heating apparatus for the middle and lower classes. That the supply of the very inferior apparatus often put in by fitting firms must be checked by every possible means. (8) That where gas and electricity are both available, reliable comparative trials of cooking with gas and electrical apparatus should be carried out, and the results placed at the disposal of the new organization for promoting the sale of gas.

The Committee further suggest that the latter organization should collect literature, both native and foreign, on heating and cooking by gas, with a view to compiling therefrom a comprehensive pamphlet suitable for publication. Finally, books on, and recipes for, gas cooking should be published. The foregoing hints should be taken by gas engineers as intended for adaptation according to local conditions; and the Committee invite suggestions for their modification and extension. The report is signed by the Chairman of the Committee, Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, who, however, was unfortunately prevented by indisposition from presenting it himself at the meeting of the Association.

Other Committees.

An abstract translation of the report of the Committee for the Instructional and Experimental Gas-Works of the Association was given in the "Journal" last week (p. 961), and some notes were also given at the same time on the contents of the report of the Committee on Photometry, which report has not yet been issued in full. The reports for the past year of all the Technical Committees of the Association have therefore now been dealt with in the "Journal;" the fulness of the treatment given them varying, not according to their respective lengths, but according to the extent to which their contents seem likely to be of interest to English gas engineers.

Prices realized at an art sale at Christie's recently showed that the late Sir Frederick Mappin was fortunate in other spheres of life than as a gas administrator. During the sale of his pictures, a canvas by Constable, "Stoke-by-Nayland, Suffolk," sold for 8800 guineas—an auctioneer's record for a Constable. In 1879 this very picture was sold for 740 guineas.

In connection with the road-tarring experiments of which the results have been recorded from time to time in the "Journal," the name of Mr. Rees Jeffreys has been frequently mentioned, in his capacity as Secretary of the Roads Improvement Association. We learn that he has now been appointed Secretary of the newly-formed Road Board. The selection is a very good one, for, though quite a young man, Mr. Rees Jeffreys is an authority on systems of highway administration; and we believe it was mainly through his efforts that a Departmental Committee of the Local Government Board was appointed to inquire into the subject as far as regards England and Wales.

THE USE OF GAS FOR INDUSTRIAL PURPOSES.

By Dr. E. Schilling, of Munich.

[Abstract Translation of a Paper read at the Meeting of the German Association.]

The general assumption that the use of gas for heating purposes is a modern innovation is erroneous. So long ago as 1858 it was announced in the Technical Press that the Cathedral at Berlin had been heated by gas for about two years past, and also that there were eight gas-stoves in the Church of St. Katherine, at Hamburg. The principle of the burner, known as the Elsner, used in these stoves was the combustion of gas above a wire gauze, beneath which it had been mixed with air. These Elsner burners were used for a variety of heating purposes; and the author remembers quite well one being used at his home in his boyhood for boiling the tea kettle. It was also reported at the same time that a patent (dated January, 1857) had been granted for the heating of irons for laundry work by means of gas; and in 1859, a soldering apparatus for continuous soldering by means of gas was described. This included the use of a blast worked by a foot bellows.

In 1859, also, a Görlitz firm advertised gas cooking and heating apparatus; while a Berlin firm were supplying gas-stoves for heating churches, gas-fires, gas-grills, and baking-ovens, as well as boiling burners for kitchens and chemical laboratories. In an advertisement of Elsner, of Berlin, in July, 1859, it was pointed out that there was scarcely a branch of domestic work, of industry, and of business for which a gas cooking or heating apparatus could not be recommended. Thus it is evident that the use of gas for industrial purposes is considerably older than is usually assumed, and that it has not been brought about through a falling off in the use of gas for lighting due to the spread of electricity. The Paris Exhibition of 1867 contained the first gas-engine of Otto-Langen type, thereby indicating that gas was already applicable at that date in industry in the most varied directions. Besides cooking apparatus, there were also exhibited there singeing apparatus for use in wool-works, dye-works, and bleaching-works. Jewellers also were using gas. Plant for chemical and metallurgical purposes and laboratory ovens were also shown.

Attention is at the present time turned again to industry by the development of an enormous number of new applications for gas; and it is important that the gas engineer should be acquainted with them in order to meet the threatened competition of electricity for heating purposes in industry. A short time ago, the author was visiting a works in which gas was used for the hardening and tempering of watch springs; and he was informed that only the day before a representative of a large electricity firm had been setting out in a most convincing manner the advantages of the electrical hardening of steel. This reminded the author afresh of the necessity that manufacturers should have explained to them by representatives of the gas industry also the advantages of heating by gas. Numerous instances demonstrate how much can be done in this direction if the gas industry actively pushes the application of its staple product. A representative of the gas industry can be helpful not only in bringing to the notice of consumers the most suitable apparatus and burners, but also he can gain their confidence by teaching them how to use gas economically. By this means their satisfaction will be assured.

The competitors with which gas has to reckon as a heating agent are steam, water gas, producer gas, solid fuels (among which is its own bye-product, coke), and, finally, electricity. While all these competitors, with the exception of electricity, present advantages, in the smaller absolute cost of the heating agent, electric energy is the dearest of all, and it must be again and again brought to the notice of the public that 1000 cubic feet of gas, costing 2s. 10d. to 4s. 6d., contain 561,800 B.Th.U.; whereas 1 unit of electricity, costing 1½d. to 2½d., can, in the most favourable case, develop only 3428 B.Th.U. Consequently, electricity can merely come into play as a heating agent in quite exceptional cases. If gas engineers were called upon to leave lighting to electricity, they might with far greater justice call upon electricians to leave heating entirely to gas. All the advantages that are claimed by electricians, such as convenience, easy regulation of temperature, adaptability, &c., are to be attained in at least as high a degree, if not higher, with gas; and the apparatus required for the latter is for the most part simpler and cheaper. No injury, therefore, need be feared for gas from the competition of electricity, if gas engineers assist industrial consumers who have to reckon their working charges most carefully, to apply gas in a rational and an economical manner. The advantages of gas should be explained to them just as the advantages of electricity are explained by electrical concerns.

More serious rivals for gas are the cheaper heating agents, particularly steam. The sale of gas will, however, extend more in competition with the latter the greater is the success in utilizing rationally the calorific power of the gas and the greater the extent to which the properties of gas-flames dependent on their nature, varying temperature, and shape are rendered available. In order to present a review of the extent to which gas has at the present day obtained a footing in industry and business, the author has appended to his paper a list of the apparatus used for heating with gas, the purposes for which it is used, and the names of the most important Continental makers of such apparatus. The list only contains the results of the author's own knowledge

and inquiries; and he hopes that it may be extended by others. Nevertheless, the list, incomplete though it may be, indicates the directions in which gas has been applied with success and in which an increase in the use of gas is to be obtained.

There is wide scope for the use of gas in annealing and smelting by means of muffle-furnaces heated by a blast. Gas here competes especially with the cheaper descriptions of gas, such as water gas, producer gas, and also with furnaces heated with coke. The chief advantage of gas firing consists in the extraordinarily simple regulation of the heat and the convenience with which it can be supervised. Soot and smoke are also avoided. The use of water gas and producer gas is only possible where the amount of work to be done admits of a special gas plant being employed. The rapid development of machine tools makes it necessary to use in all works well hardened, sharp steel tools; and in all such cases tempering or case-hardening furnaces heated by gas are applicable. The tools are raised to incandescence in a muffle or other furnace and are heated to a temperature varying from 550° to 1200° C., dependent on the quality of the steel.

The second important operation is the cooling or tempering of the steel, which takes place in the absence of air in baths of saline solution, oil, or molten white metal. Various types of gas-furnaces are used according to the procedure required. There are also crucible furnaces for melting metals of all kinds, such as gold, silver, copper, brass, &c., in graphite crucibles; and these gas-furnaces are extensively used both in laboratories and in the refining and working of metals, and in the manufacture of alloys. Somewhat similar furnaces are also used in the porcelain, enamel, and glass industries, for the continuous and rapid burning-in of designs on glass, porcelain, &c. The heating gases in these cases envelop, in the first instance, the lower or high temperature muffle-furnace, then pass on to the upper or preparatory furnace, and, lastly, to the drying chamber; so that they are completely utilized. One firm of apparatus makers supplies for modern tool manufacture a special form of salt bath crucible oven, which is used where rapid cutting tools of tungsten steel are employed, the temperature for tempering which is from 1100° to 1300° C.

There is wide and varied application for gas for soldering and brazing, with apparatus ranging from the simple soldering bit heated by the Bunsen flame, to the blast brazing tables which are used in the cycle industry. The modern forms of appliances present great economy over the old soldering irons heated with the bunsen flame, and for work of considerable size the use of the blast appears to be desirable. The blast allows the heat to be applied exactly at the desired point, and is therefore in many cases very advantageous. The electrical power available in most works can be used in the simplest manner for providing the blast. It is worth observing that the electrical apparatus works are most important consumers of gas for these purposes. The melting of metals for printing machines is also an extensive business.

Recently, autogenous welding, which, in essence, is nothing more than a smelting process, has come into extensive employment. The apparatus formerly used for the purpose with hydrogen and acetylene has been adapted by one firm for use with coal gas. The calorific power of the gas is first increased by carburetting it with benzoline vapour. The temperature of the welding cone of the carburetted coal-gas-oxygen flame is about 2000° C., and the flame, like the hydrogen flame, serves to effect weldings of metal up to a thickness of 2½ to 3 inches. The cost is lower than that of hydrogen, apart from the fact that coal gas is available nearly everywhere, and it is unnecessary to provide for the storage of compressed gas in steel cylinders. A pamphlet on autogenous welding with coal gas and oxygen has been issued by the firm of Jacob Knappich, of Augsburg.

It has already been indicated that gas is especially applicable where high temperatures are required. The number of works in which gas is used for heating to moderate temperatures is legion. One of the oldest uses is for singeing apparatus in the textile industry. For working on the large scale, producer gas appears to be cheaper, and also to have the advantage that the flame is more suitable for singeing than a coal-gas flame. This question has been discussed in recent technical literature; but attention should be given to it by gas engineers in order to ensure that coal gas is not driven out of a field of application in which it has answered well for many years, and in which further inquiry may show it is still the most suitable agent. Gas is also extensively applied in the box making and hat industries. A large industrial use of gas is for heating irons; and though coke or electricity, and with large ironing machines, steam also, are applicable, gas possesses the advantage of being serviceable for either the smallest smoothing iron or large ironing machines. Special types of ovens are also extensively used for heating a number of irons, up to twenty, for use in the millinery business. They are distinguished by the low consumption of gas and high efficiency obtained. In these applications, special attention has been paid to improving hygienic conditions in work-rooms. In laundries, hospitals, &c., there is frequently used, in addition to the steam-heated ironing machine, a gas-ironer, consisting of a hollow steel roller heated from within with gas under an air-blast.

There is scarcely a branch of modern industry in which gas-heated apparatus for drying does not find a place. Though steam may hold the premier position in this connection, gas has extensive and increasing use. The possibility which it presents of drying at a lower or higher temperature as required, and of regulating the temperature readily and exactly, are advantages which ensure it a great future in this direction. When used in conjunction with thermostats, gas becomes available for maintaining any desired temperature constant for any length of time. An instance of this application of gas is the heating of incubators. Recently also gas has come into extensive use for the curing of the so-called "smoked" meat. The use of gas in the jam and similar industries is well known.

The use of gas also for boiling and roasting and baking in hotels, restaurants, and eating-houses, is too well known to need emphasis. The hygienic advantages of gas as a fuel, especially in sanatoria and hospitals, are so great that in modern installations gas is taking the place of steam. For example, in Davos, where the avoidance of smoke and soot is imperative, gas is almost exclusively used. Finally, the employment of gas for heating water, which originally only applied to water-heaters in bath-rooms, has at the present time extended so that gas is regarded as an indispensable auxiliary for the supply of hot water to whole buildings and works. Its advantages, compared with solid fuel, have become recognized for central heating plant; and it may be anticipated that, just as for cooking the coal-range is being forced into the background, so for heating solid fuel will constantly be more and more ousted by gas.

It will be realized from this brief review of the extensive field in which gas is applicable in industry and business that it is practically impossible to enumerate all its applications, let alone to describe them in detail. Such was not the author's purpose. He wished rather to draw the attention of gas engineers to the wide possibilities of increasing the output of gas for heating purposes, and believes that this paper, with its appendix, may serve to incite others to extend these possibilities. The times are now past in which gas-works can afford to ignore the development of this branch of trade. They are compelled, like any tradesman, to work up their business; and the author hopes that his paper may come as a small aid to them in this direction.

The appendix to the paper is an extensive list of the different types of gas apparatus for industrial and business purposes, with the classes of works or manufactures in which they are used, and the names of the firms in Germany who supply them. Since, so far as we can judge from glancing through the list, the types of apparatus enumerated are, with many others, made also in this country, it does not seem to be necessary to refer further in the "JOURNAL" to this appendix.

Canadian Gas Association.

According to the accounts which have reached us of the third annual meeting of this Association, which was held at Hamilton (Ont.) from the 9th to the 11th ult., under the presidency of Mr. J. S. Norris, of Montreal, it was altogether very successful. The following papers were submitted: "Some Methods of Measuring Light," by Mr. W. C. Philpott, the Chemist to the Toronto Consumers' Gas Company; "New Business Methods," by Mr. B. G. M'Nabb, of Montreal; "Gas-Engine Development, Construction, and Application," by Mr. R. A. Fraser, of Toronto; and "Recent Gas Installations in Hamilton," by Mr. E. A. Howe. Messrs. Hewitt and Keillor submitted a report by the Committee on the Illuminating Power and Calorific Value of Gases Made in Canada; and Mr. Norman Macbeth, the Manager of the Illuminating Engineering Laboratories of the Welsbach Company of Gloucester (N.J.), delivered a lecture on "The Importance of Illuminating Engineering to Gas Companies." In connection with the meeting, the first Canadian Gas Exhibition was held from the 6th to the 11th ult. The social functions incidental to the gathering appear to have been of a very pleasant character. The new President is Mr. Arthur Hewitt, of Toronto. We hope to notice the proceedings at greater length in subsequent issues.

The Calcutta Appointment.—Readers will probably remember that the Calcutta Corporation a short time ago invited, in our advertisement columns, applications for the position of Gas Lighting Superintendent. We learn that the appointment has been conferred upon Mr. H. V. Eastwell, who was for some years with Messrs. Pontifex and Co. He has had the personal supervision of the fixing of large installations of incandescent gas lighting in London and the Provinces, and considerable experience in the maintenance and general supervision of public lamps on this system. The salary is Rs. 500 per month, rising to Rs. 750 per month by equal annual increments.

Road-Tarring in Illinois.—A tar macadam road, 30 feet wide and 400 feet long, was put down as an experiment at Kankakee (Ill.), to discover whether this form of highway construction would reduce the dust nuisance caused by the wearing away of the top dressing of the shale macadam streets which are used to a great extent in that section. The dust from the limestone was washed into the sewers, and formed a sediment which was removable with great difficulty. The street re-surfaced had been paved with stone macadam three years before. Ordinary coal tar, direct from the local gas-works, was used, after being allowed to settle for about a month in a large well, heated by a steam coil. It was applied to the road from 10-gallon hand sprinklers—the only method available. Upon the hot tar was spread a top covering of crushed limestone, which was compacted by a 20-ton roller. After a period of three days, the street was opened to traffic.

STEEL GASHOLDER TANKS MADE WITH BULGING SIDES.

[A Paper read before the Société Technique du Gaz.]

By M. Edouard Bonnet.

One of the most interesting papers read at the annual meeting of the Société Technique du Gaz described the design and form of a new gasholder tank in steel, patented and made by the Maschinenfabrik Augsburg Nürnberg, and erected at the municipal gas-works Simmering, Vienna. The distinguishing feature of this tank is that, instead of the usual vertical side plates of varying thicknesses, its sides are curved or bulged, or (to use a more expressive word) bellied-out; and the plates composing it are of the same thickness throughout. It is claimed that this gives a more flexible and, technically, superior structure. The shape of the curve resembles somewhat the old Roman form of tanks and the ancient pots for wine, oil, or other liquids. The gasholder working in this tank is a telescopic one of four lifts, containing 150,000 cubic metres, or about 5,300,000 cubic feet. The writer of the paper—with the title "A Note on Metal Gasholder Tanks with Curved Sides"—was M. Bonnet.

Reduction in the price of gas, and increased make, have necessarily led gas companies to use larger and more economical apparatus. While considerable progress has been made in retort furnaces, in purification, and in the treatment of bye-products, &c., the question of gasholders has long remained stationary. In France, up to recent years, Paris only had gasholders of 30,000 cubic metres (about 1,060,000 cubic feet); Lyons, Marseilles, and Bordeaux had none exceeding 20,000 cubic metres (706,000 cubic feet). In England and America, however, there are gasholders of 345,000 cubic metres (say, 12 million cubic feet) and 425,000 cubic metres (or 15 million cubic feet). In Germany, towns of less importance than ours ordinarily have holders of 50,000 cubic metres (1,766,000 cubic feet), 100,000 cubic metres, and more.

This increase of volume has the great advantage of reducing the price of storing gas, per cubic metre, from 30 to 10 frs. and even less, as the gasholder becomes larger. But if the volume of gasholders and the number of lifts are increased, the mode of construction of the tank, which is the most delicate part, has not been improved. The tank of a gasholder of 150,000 cubic metres (5,300,000 cubic feet) is, in fact, made in the same way as that for gasholders of 10,000 cubic metres (353,000 cubic feet); and this type is neither logical from the point of view of the distribution of the tank metal, the function of the sheeting and its strength, nor economical as a structure.

A tank in sheet steel consists (fig. 1) of a bottom, A A^1, a vertical cylinder, B B^1, an angle-iron, C, joining the two, a circular gangway, D D^1, and gussets, B D D^1, supporting the standards. The gussets are riveted to the tank, and transmit to it the force of the wind, which acts on the lifts and guiding frame. The drawbacks to this arrangement are as follows:

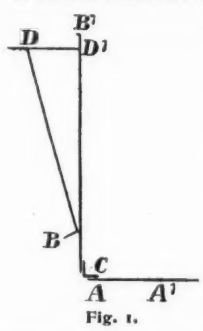


Fig. 1.

(1). The metal used for the bottom is absolutely useless from the point of view of resistance. This bottom only ensures the tightness of the cylindrical part of the tank with the foundation. If this tightness could be secured otherwise, the whole of the metal of the bottom could be done away with. There is, therefore, here a considerable amount of metal, which often represents a quarter of the total weight of the tank, and which has no really useful place in the construction.

(2). The vertical cylindrical part resists the pressure of the water, which gives rise to circular tangential strains. Its thickness is calculated on the French formula: $E = \frac{H D}{2 \times K \times R.}$ where K is the relation of the resistance of the riveting to the full plate. This thickness is, then, proportional to the diameter and to the height of the tank; and, when diameters of 60 and 80 metres (197 feet and 262 feet) are reached, if safe limits in the working of the metal are desired, it is necessary to have plates up to 50 and 60 mm. in thickness (1·969 and 2·362 inches). The weight of tanks is then too much; the work of hydraulic riveting, the coincidence of the rivet holes which it is necessary to drill, the placing together of the plates, are all difficult; and lastly the price is high. If the thickness of the plates was independent of the diameter, as in the system to be explained, there would be considerable improvement and great saving effected.

(3). The angle-iron joining the bottom to the vertical part is inevitably very thick. While the interior pressure increases the diameter of the tank, the bottom of the lower ring of plates, strengthened by the angle-iron and held by the bottom plates, cannot take part in the general tension of the circumference, and causes partial strains which are dangerous and lead to bursts.

(4). The gangway, like the bottom, consists of ironwork which does nothing. Its only effect is to ensure the circular form of the tank and it adds nothing to its strength.

(5). The force of the wind is carried on to the tank by the gusset plates supporting the standards.

Such a tank, which already bears uniformly distributed forces by the pressure of the water, has thus added to it considerable strains (varying in position and intensity), which it is almost impossible to ascertain. All these drawbacks—almost nothing in small gasholders—become serious in larger ones. The fact of having metal in certain parts which does nothing, and which in others exerts itself badly and uneconomically, leads to an increase of weight and of price which one ought to try to reduce.

To obviate these disadvantages, the Maschinenfabrik Augsburg Nürnberg (designated the "M.A.N." Company) have endeavoured, by a better apportioning of the metal, to design a tank which will have greater strength and be more economical both as regards the tank and its framework. The principle of the "M.A.N." tank is to replace the vertical rectilinear side of the tank by a flexible curved side, sustaining equal strains at all its points.

Let us suppose a perfectly flexible and resisting envelope—a sack, for example. If it is hung in a rigid circle, as when being filled, and if it is filled with water allowed to rest partly on the ground, it will take such a shape that it will have, at any point of the envelope, outward strains from the side, which are equal all over. This phenomenon is analogous to that of a heavy wire—perfectly flexible, and merely stretched between two points of support. This envelope will only have to resist the forces of tension in the meridian planes. Its form, and the strains which it will carry, will only vary with the total height of the water. The diameter of the vessel will not have any influence either on the strains which support the envelope, or, consequently, on its thickness. As regards the circular tension on the side, it is negligible on account of the tension following the curve.

Distribution of Strains.

Fig. 2 gives the outline of the system. The two ends of the curve at A and C must be kept fixed; and the strains at these two points are directed according to the tangents to the curve. At C, the strain is horizontal; and it is balanced by the tension in the bottom. This tension is identical with that of the curved side. The thickness and the fixing together will, therefore, be the same in the side as in the bottom, the metal of which is now utilized rationally. The curved side is connected to the bottom, of which it is the tangential extension, by direct riveting. The bottom angle-iron (the drawbacks to which have just been explained) is done away with. At A, the strain follows the tangent A F to the curve. This will be counteracted by the horizontal circular girder A A^1, and by the vertical uprights D A B, the resultant of which is directed along A F. These uprights D A B, connected together by Saint Andrew crosses, rest on the ground across the bottom through the medium of the supports K. The curvature of the plates, the greatest dimension of which is on the meridian, is made so that the line of the middle of the vertical section of the plate coincides with the supporting curve

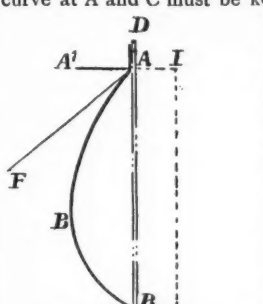


Fig. 2.

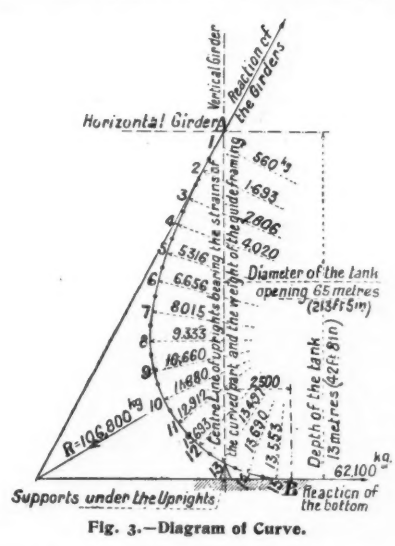


Fig. 3.—Diagram of Curve.

resulting from the pressure of the water. The pressure of the cylindrical column of water, which rests directly on the bottom, and is limited by the line I C, is received by the bottom itself and

transmitted to the foundation. The volume of water, enclosed in the annular space limited by the line I C, and by the side of the tank A B^1 B, gives rise to a total pressure directed towards the outside and the bottom, the vertical component of which finds a support on the point K, which transmits the pressure direct to the foundation.

It is interesting to observe that the general form of this curve is that which the Ancients, and especially the Romans, gave to the large-sized tanks in which they kept their liquids. The large pottery jars, containing several hectolitres of wine or of oil, were of a shape very analogous to that of the "M.A.N." tank.

Outline of the Curve.

The curve of the side can be easily followed from the diagram, fig. 3. Let us suppose the problem solved and that A B is the curve desired, and is such that it supports equal strains at all its points. Let us take a set, one metre wide on the circumference of the opening, and divide the curve into fifteen equal divisions. At the centre of gravity of these divisions, let us apply the water pressures. The table herewith gives the value of these pressures at different points.

Table of Water Pressures at Different Points of the Curve.

Number of Points.	Opening out of the Plate.	Length of Plate.	Surface.	Distance of Points from Top of Tank.	Pressures.
			Sq. M.		Kilos.
1	1·020	1·100	1·122	0·500	560
2	1·040	,,	1·144	1·480	1·693
3	1·050	,,	1·155	2·430	2·806
4	1·075	,,	1·1825	3·400	4·020
5	1·090	,,	1·200	4·430	5·316
6	1·100	,,	1·21	5·500	6·655
7	1·110	,,	1·22	6·570	8·015
8	1·110	,,	1·22	7·650	9·333
9	1·110	,,	1·22	8·740	10·660
10	1·105	,,	1·215	9·780	11·880
11	1·095	,,	1·20	10·760	12·912
12	1·075	,,	1·0825	11·580	13·693
13	1·030	,,	1·10	12·270	13·497
14	0·980	,,	1·078	12·700	13·690
15	0·950	,,	1·045	12·970	13·553

By carrying out the strains following the one with the other, parallel to their direction, the polygon of strains (fig. 4) is formed, the closing line of which gives in full and in direction the resultant RR^1 of the pressures. [The author then proceeds to show how the polygon is made up.] In practice, in order to lay out the

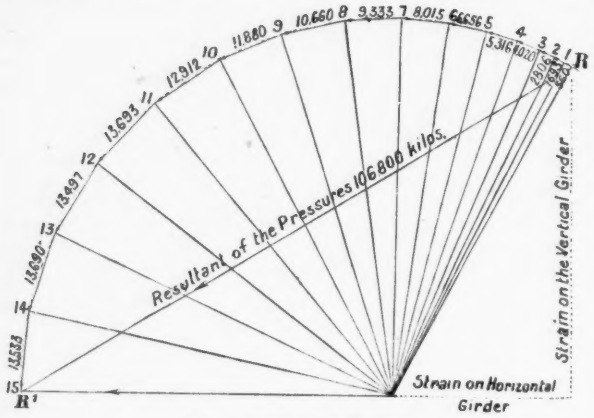


Fig. 4.—Polygon of Strains.

1 mm. represents 500 kilos.

curve (the points at which it must end being given), any curve whatever is traced out and one applies to it the water pressures in each division. Then the polygon of strains corresponding to these divisions is traced; and this polygon should be within a circle, if the curve is exact. If not, one begins again, and by repeated attempts arrives at the curve desired. Ascertaining the tensions and the form of the curve can also be obtained analytically.

A tank like this weighs about two-thirds of what a tank with a rectilinear side would weigh, the function of the metal being the same. Where the thickness of the rectilinear side would vary from 6 to 35 mm. (0·236 to 1·378 in.), a uniform thickness of 5 mm. (0·197 in.) is sufficient for the "M.A.N." tank. This thickness is increased up to 7 or 8 mm. (0·276 or 0·315 in.) from the constructional standpoint.

Filling the Tank.

During the filling, the circumference of the tank does not present a surface under equal strains, as the form of the side has been arrived at by supposing the tank to be full. To prevent its deformation during this filling, latticed girders are constructed, confined by the vertical uprights, and curved according to the curvature of the side to which they are riveted (see fig. 5). These girders will have their use only at the moment of filling, and do not take any part in the resistence of the tank when once full. They could be done away with after the filling. The rivets fastening them to the side do not serve any purpose when the tank is full. The force of the wind not being carried on to the side of the tank, the corresponding drawback noticed in cylindrical tanks is overcome.

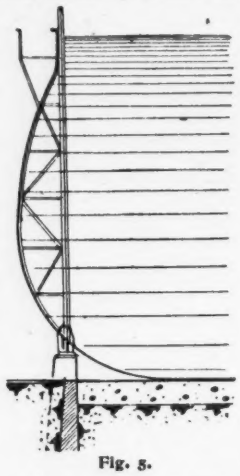


Fig. 5.

Foundations.

As the rigid plates of the "M.A.N" tank, which take all the weight of the metal work and the pressure of the wind, rest on the masonry supports which surround the tank, the strength of these supports is only of importance in the one essential of the foundation. Even the bottom only supports the weight of water; and calculation has shown that an important depression in this part of the foundations would require only a slight increase in the work done by the plates.

The foundation consists then of two parts:

(1). An annular wall formed in concrete, the wall going down to solid ground. On the top of this wall are placed the rest stones K (fig. 2) corresponding to the uprights intended to support the standards. At these points, the annular concrete wall is strengthened by buttresses.

(2). The central surface, after taking up the bed of soft earth, is simply recovered with layers of gravel and sand, watered and rammed, over which a bed of cement from 20 to 30 mm. thick is laid, so as to ensure the binding of the gravel and to smooth the surface. Above this, a layer of asphalte, 30 mm. thick, is spread, in which the rivet heads sink down so as to be certain of contact with the foundation.

In case of the sinking of one of the supports, K, of the framework of the tank, the connection of the different parts is enough to avoid deformations or tangential strains. The form and the position of these supports round the tank render the adjusting of it easy in case the ground slips, without involving the difficulties which the raising of a cylindrical tank presents, resting wholly and directly on the foundations. The foundation of the "M.A.N." tank is thus appreciably cheaper than would be the foundation of a straight tank.

Annular Tanks.

When the ground is very bad, and foundations have to be made on piles, annular tanks are introduced. These tanks have the serious inconvenience of having their inside ring under compression; and consequently they are easily distorted. To avoid this inconvenience, either very strong inside plating to stiffen the inside ring is used, or stays braced by bulky framework or reinforced concrete are adopted. But the mass of metal used causes the net cost to be almost as high as if the whole of the foundation had been piled all over the surface.

The "M.A.N." tank lends itself very well to the annular form, and can be easily understood from fig. 6. Both the exterior and the interior sides are in tension and under the same conditions. There is no longer any side under compression. The part A, A, representing the bottom is in equilibrium. The parts A, C, B, D, have their two sides the same. This arrangement is only given as a record; but it shows an excellent solution of the annular tank. It should, however, be added that it has not yet been made.

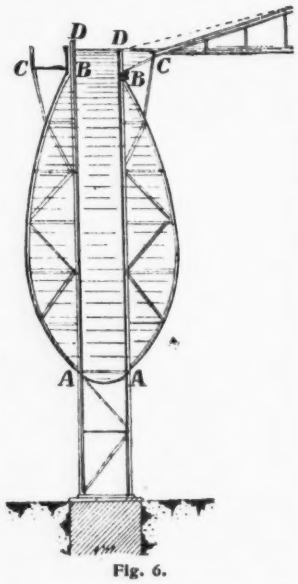


Fig. 6.

Other interesting improvements have been proposed by the "M.A.N." Company in the guiding, in details of construction, in the framework supporting the crown, and in the warming of the hydraulic cups. It is only possible to name them here; the author being desirous of calling attention chiefly to the tanks with curved side, which marks important progress.

The "M.A.N." Company have under construction the following gasholders with curved sides:—

One of 250,000 cubic metres at Brigittenau, Vienna;
,, 40,000 ,, ,, ,, Mayence;
,, 120,600 ,, ,, ,, Nuremberg;
,, 25,000 ,, ,, ,, Augsburg.

One gasholder of this type, of 150,000 cubic metres capacity, is now regularly used at the gas-works of Simmering, Vienna. The Municipal Commission to whom was entrusted the acceptance of this gasholder has, during and after the filling of it, taken observations and precise measurements which are of considerable interest.

The measurements of elongation taken at the largest circumference of the curved tank—that is, at point B in fig. 7 (taking into account the influence of the temperature)—showed that the circumference, which was 217·59 metres, was elongated 78 mm. (3·071 inches). The static calculation had anticipated 76 mm.

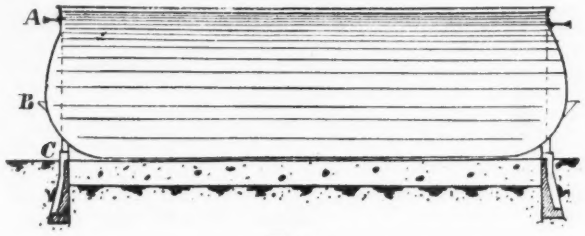


Fig. 7.

The measurement taken at the point A, at the top of the ring of the tank, gave an elongation of 100 mm. (3·94 inches). The static calculation had given 99 mm. As regards the horizontal position of the tank, it was ascertained that the top of the tank had given way at the maximum 5 mm. (0·197 in.); the conditions imposed had allowed 65 mm. (2·559 in.). The sinking at the point C was 15 mm. (0·591 in.) The elastic elongations of the curved tank, as measured, were, therefore, nearly in absolute agreement with them as they had been calculated. This remarkable agreement is due to the fact that the form adopted for the work is such that all the strains which arise are ascertained statically, without it being necessary to bring in hypotheses of distortion, as one is obliged to in most metal structures.

On account of the excellent result of the filling of the tank, a new gasholder of five lifts with a curved tank, of 250,000 cubic metres, has been ordered for the works at Brigittenau.

This new type of tank appears, therefore, to be of considerable interest where gasholders above 20,000 cubic metres (706,300 cubic feet) are contemplated, but especially for those of the largest size, both from the point of view of sound construction and in regard to economical installation.

THE PARIS RETORT-DISCHARGING MACHINES.

By M. Antoine Foillard.

[Abstract of a Paper read before the Société Technique du Gaz.]

One of the visits made by members of the Société Technique du Gaz during their annual meeting was to the Landy works of the Paris Gas Company, where were seen many important electrical appliances for the handling of coal and coke. Among these were the Sautter-Harlé electrically driven coke-discharging machines, which, it will be remembered, were adopted by the old Compagnie Parisienne du Gaz. There are thirteen machines on this system now in use, and four in course of construction. It was fitting, therefore, that there should be a paper dealing with these machines; and M. Foillard contributed a short one to the proceedings, under the title of "A Supplementary Note on the Electrical Dischargers of the Société du Gaz of Paris." His paper showed that experience had led to the simplifying and strengthening of the dischargers; and the main point dealt with was the adoption of a discharging machine having two rams instead of one, which allows greater freedom in the working, and permits one ram or pusher to be at rest and to cool down while the other is at work.

He said: My object to-day is not to describe the principle of these machines, which I put before the meeting of 1906; but rather to give some details that may be of interest. These dischargers are of two different models, one with a single pusher, and the other with two pushers, placed side by side, which can be used alternately, passing from one to the other by means of gearing, put into or out of work by a lever under the control of the driver of the machine.

Fig. 1 shows the two end plates of the rams and the coupling gearing, which can only be put into operation by one or other of the two sets of gearing driving the pushers. The advantage of this arrangement is to give the machine greater power in case of its being called upon to do an unusual amount of work, either regularly or through accident. There is always one pusher cooling itself while the other is at work.

In a general way, both the single and the double pushers which the Société du Gaz of Paris have at work, have been much simplified and strengthened. Experience has shown us that in these installations, it is before all things necessary to have strong material, free from all complication; and automatic combinations, that we formerly had, were found to have greater drawbacks than advantages.

The author then refers to the three types of racks working the pusher-plate that have been tried on the Paris machines. The

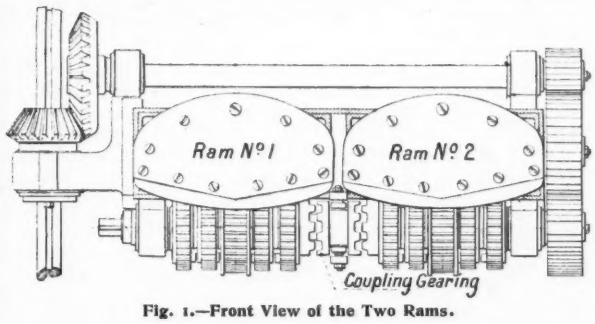


Fig. 1.—Front View of the Two Rams.

first was a small one of simple flat iron, 30 mm. wide by 75 mm. deep (1¼ in. by 3 in.). It soon got hot, and required repairing. The second type was a built-up one, consisting of a flat bar across two angle-irons, separated and closed by an inverted T-piece. The groove in the middle was used to receive the water for keeping the pusher cool. This artificial cooling was not found to be successful; and the necessity for having a water-tank on the machine (which tank often failed to get filled) also proved inconvenient. So the third, and last, form has been adopted which has given every satisfaction. It is a massive bar of forged steel of double T section, and of great rigidity, both horizontally and vertically. It is 90 mm. wide by 100 mm. deep by 32 mm. thick (about 3½ in. by 4 in. by 1¼ in.).

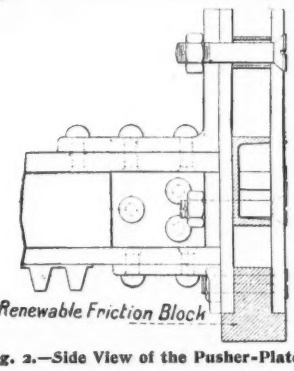


Fig. 2.—Side View of the Pusher-Plates.

Fig. 2 shows a side view of the pusher-plates. It consists of two plates, each 12 mm. (½ in.) thick, braced by tubes, through which the bolts pass, and strengthened by a channel iron. At the bottom part are two blocks or friction plates which can be easily renewed when worn out. In the original machines, the ram end consisted of a single plate. It quickly got distorted, becoming V-shaped and making a wedge in the mass of coke.

The author proceeds to give some figures relating to the normal working of the machines with a single ram; the retorts being 6 metres long (19 ft. 8 in.) and charged with about 600 kilos. of coal (nearly 12 cwt.), which is carbonized in eight hours. The results given have been obtained while the machines have been undergoing the ordinary methodical upkeep, which the Société du Gaz organize so well. The average time for the discharge of one retort, including all accessory movements, is 55 seconds; or in 60 minutes each machine could discharge 65 retorts. The speeds per second for the different movements are as follows:—

Pusher	Discharging	360 mm.	(say, 14 inches)	
	Return	460 ,,	(,, 18 ,,	)
Travel of the machine		600 ,,	(,, 24 ,,	)
Vertical movement	Upwards	220 ,,	(,, 8¾ ,,	)
	Downwards	230 ,,	(,, 9 ,,	)

The consumption of electricity, at 240 volts, in normal working is as follows:—

Pusher	Discharging	1800 watts
	Return	1080 ,,
Travel of the machine		1200 ,,
Vertical movement	Upwards	1800 ,,
	Downwards	720 ,,

From diagrams taken, it appears that the expense of energy in normal working per retort discharged is only about 17 to 20 watt-hours. Reckoning 25 watts (to take into account wrong movements and anything unforeseen), the result is arrived at that forty retorts containing 17 (metric) tons of coke, and having produced about 7200 cubic metres (254,280 cubic feet), are discharged with an outlay of energy of 1 kilowatt-hour.

Gas from Peat.—A French patent has been taken out by the Peat Gas and Coal Company for a process of manufacturing gas from peat. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the wet peat is treated in a disintegrator so as to destroy its porosity, and at the same time it is sprinkled with petroleum or other hydrocarbon. The pasty mass is then heated in a retort until it is converted into coke. Air is admitted to the retort during the coking, and the heated air, mixed with gas from the retort, is carburetted by passing through tar obtained from the peat. The gas is then cooled and the bye-products are condensed.

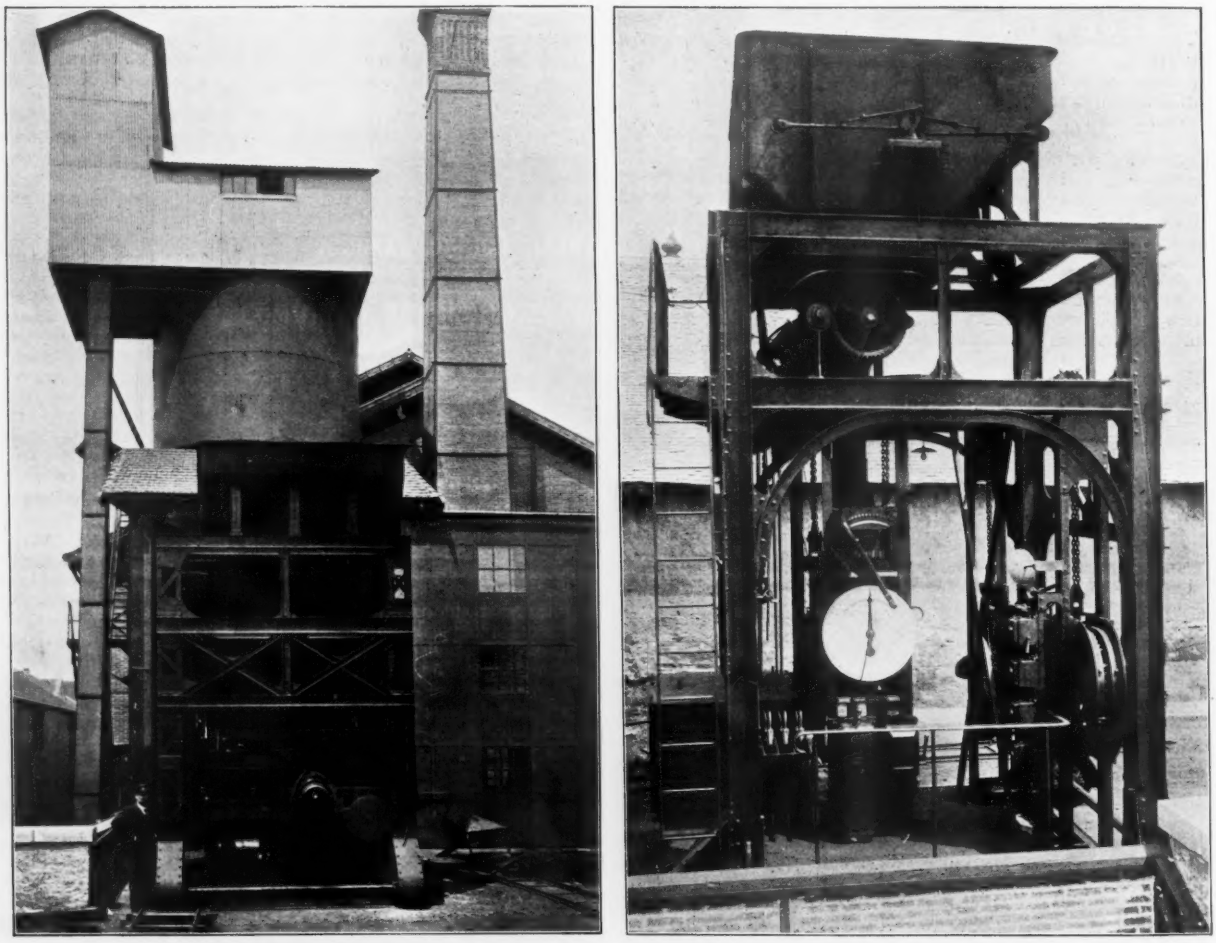
COMBINED DE BROUWER RETORT CHARGER-DISCHARGER.

By M. R. de la Boulaye.

[A Paper read before the Société Technique du Gaz.]

Both the Paris design and the De Brouwer type of retort charging and discharging machines came in for some notice in the proceedings at the annual meeting of the French Gas Society. The object of the paper dealing with the latter type was not to describe the separate charging and discharging machines on the De Brouwer system, which are so well known and appreciated, but to bring to notice a combined machine, made by the Compagnie Anonyme Continentale, and at work at the Angers Gas-Works. The author of the paper, M. R. de la Boulaye, points out the improvements that have been made—such as having an independent motor for the pusher, instead of driving it from the travelling motor; and an indicator for showing the actual amount of coal projected into any given retort. He compares the separate machines with a combined one, and also a suspended charger with one travelling on the floor; and he comes to the conclusion that the latter requires more upkeep than the former, but that in the majority of cases the balance of advantages rests with the travelling charger. For gas-works of average size, he considers the combined machine is the neater and more practical.

At Angers, the charger and the pusher are side by side on a carriage-frame running on four wheels, two of which are driving ones. Over the top is a storage tank, of about 6 cubic metres (212 cubic feet) capacity, for the feeding of the charging machine. There are three motors—one for the charger, another for the pusher, the third for the general driving. The electric current is taken by a trolley from an overhead wire. The current goes by way of a commutator in two directions—either to the discharging motor, or to the general one, which (by means of three sets of gearing) drives the travelling, the lifting and lowering apparatus, and the Archimedian screw supplying the charger. All levers are close at hand for the driver of the machine, who has also in sight



The Combined De Brouwer Retort Charging-Discharging Machine at the Angers Gas-Works.

the speedometer, recording the rate of revolutions of the charger, and a divided dial, with moving pointer, showing the weight of coal thrown into the retort.

Improvements and Drawbacks.

Some improvements have been introduced in this machine. In former machines, the pusher was driven by the travelling motor by means of a vertical shaft. Now it is driven directly; and some mechanism, which was necessarily delicate, has been done away with. Further, the control of the discharge was more complicated, as it necessitated the handling of two levers. The number of motors is, moreover, not increased, as the Archimedian screw, now worked from the general motor, before required a special motor.

Another improvement is that in front of the driver is a dial, with marked divisions and a needle worked from the spiral screw, indicating the number of its turns. After each retort charge, the indicator returns to zero. A mark shows the number of divisions over which the needle ought to pass so as to get the desired charge of coal. Each division gives 6·5 to 7 kilos. (say, 14 to 15 lbs.) of coal. To verify the weight obtained, a charge is made in an experimental retort; and the coal is then withdrawn and weighed. The regularity of the layer of coal is also thus ascertained. This arrangement has undoubted advantages. It allows of variations in the weight of the charge being made even during the charging. Further, by showing at every moment what is the point reached in the charge, it ensures the regular reduction of the speed, and, consequently, the evenness of the layer of coal. But exact control of the weight of coal carbonized cannot be counted upon. Its condition, notwithstanding the spiral screw, has considerable influence on the amount of the charge. Dry, dusty coal will give more weight than when it is in lumps; wet coal will give an opposite result. With very wet coal, it hardly slides on the screw, with the result that a retort will be half full for the same number of divisions which, at another time, will give a retort crammed full. Without going to such an extreme, there are considerable variations. Thus, the same coal has given with 65 divisions, 419 kilos., and with 62 divisions 415 kilos., or only 4 kilos. (8·8 lbs.) less, instead of a difference of 20 kilos. (44 lbs.), which there ought theoretically to have been. The error can easily reach, on an average, one ton in fifty; and as it occurs sometimes one way and sometimes the other, it may be taken in

practice to be much more. However, it is the only serious drawback experienced with this machine, and, indeed, it is less than with the preceding machines. In all other ways, every satisfaction has up to now been given.

Combined and Separate Machines Compared.

It remains to be seen if it is better to adopt separate charging and discharging machines, or whether the combined machine offers equal facilities in working. The combined machine is naturally bigger and heavier than each separate machine. Its four points of support cover a surface of 3·20 metres by 3 metres, or 9·60 square metres (103 square feet); and its total height, including the slope of the coal, is 6·60 metres (21 ft. 8 in.). But though the dimensions of a single pushing machine are less than these, those of both machines would be as large.

The weight in full work of the combined machine is from 20 to 22 tons; while the weight of a single machine is about 15 tons. All that is required is to make the travelling floor stronger.

Again, it may be objected that if an accident occurs, either to the motor or to other mechanical parts of a combined machine, the whole is brought to a standstill. To guard against this, the best thing to do is to have a machine in reserve. It is in this way that we have up to now avoided not only stoppages, but also delays in the times of making the charge. Should, however, the purchase of a second machine appear too costly, with a number of change-parts in reserve, any breakdowns whatever could very quickly be remedied.

The cleaning and upkeep of the machines, which we have been able to do regularly and fully, on account of having a reserve machine, have not brought to light any apparent wear after seven months' working, notwithstanding the large bulk in motion. We do not see, therefore, how it can be argued that the weight, dimensions, and difficulties of maintenance of the combined machine are reasons for preferring separate machines.

Neither can it be said that it is more difficult to work, for our experience has proved that both the discharging and charging are very simply and very quickly done. As soon as the retort-lids are opened, horizontal tiers are discharged. While the coke is being taken away by the conveyor, the retort lids and ascension pipes are cleaned. Then the retorts are charged, the coal-tank refilled, and the machine placed for the following charge. All this requires 20 to 25 minutes to discharge 3000 kilos. of coke and to charge 3900 kilos. of coal.

All the special supervision, consequent upon the combination of the two machines in one, can be carried out during necessary stoppages; and, in our opinion, two separate machines cannot work more quickly than one combined machine. Where a large number of retorts are placed in the same line, and the charging is done immediately after each discharge, then there is an advantage in having separate machines; and the duration of carbonization in each retort is thus prolonged. This also necessitates a larger staff. If needs be, it could be adopted with a combined machine. But the cleaning of the retort-lids would have to be done first of all; and the manipulation of the machine would become very complicated. The longer time taken would thus destroy any advantage.

Comparison of Travelling and Hanging Chargers.

The combined machine, like the floor travelling charging machine with coal reservoir, has a disadvantage in comparison with the suspended charger. It cannot charge more than nine or ten retorts without returning to the main storage tank to be filled up with coal. This means loss of time. We must, therefore, compare installations having hanging chargers and storage tanks above the retort-bench, with those having travelling chargers and themselves carrying the coal.

The first arrangement necessitates an elevator, a conveyor, and coal-bunkers with supporting girders. The second always requires an elevator, but does without the conveyor and bunkers; the elevator feeding directly a general storage tank of large capacity. The last requires a strong framework to support it; but it is independent of the retort-house, which remains undisturbed, except during the time of charging.

The capital cost of these two types is practically the same; the cost of the coal-bunkers and conveyor making up for the greater cost of the travelling charger and erecting the general storage tank. The travelling charger requires more upkeep than the suspended one; but in the long run, the coal-bunkers are eaten by the oxidizing action of the coal; and the conveyor wants keeping up every minute. Generally, the bunkers are 20 metres square, or of 16 tons—the amount required for a bed in 24 hours. It is, therefore, necessary to feed them every day whatever be the number of beds in work. Some installations even have no tank above the bench; and the coal supply has to be carried on day and night, with many men, wearing out the apparatus and making repairs and upkeep difficult.

With a reservoir of 80 to 90 tons, only supplying three beds of nine retorts, as is the case at Angers, the coal is raised in the winter only five days in the week—the sixth being kept for cleaning and maintenance. Now, in the summer, it is necessary only to work three or four days per week. Besides reducing the staff, this avoids useless wear of the machinery and facilitates repairs. There is less outlay for steam, and alleviation of the mechanic's work at the electricity station at night and on Sundays.

Plants of the two types have not been long enough at work yet to afford practical information on the comparative costs of upkeep over a certain period; but it seems that in many cases the advantage lies with the travelling charger and general reservoir. Plants at very large works and those at works of average size should be distinguished. For the former, several machines have to be employed, with many general reservoirs requiring a lot of room. The size of these plants enables the full power of the elevators, breakers, &c., to be used; and the intermittent feeding of reservoirs does not present the same problem.

For a medium-sized works, however, the combined machine seems the most fitting and most practical solution of mechanical charging and discharging. The manipulation is as easy and as quick as with the separate machines; the price of the combined machine is less; the storage tanks above the bench are not required; and the coal-projector allows intermittent feeding, and consequently a better use of material. Moreover, the saving which results from the adoption of the combined machine is so much that in all works it is well to provide reserve machines, which emphasizes the difference in the cost of the two kinds of installations. In such a case, the combined machine has all the conveniences of the separate machines.

MIXING GAS AND AIR FOR HEATING PURPOSES.

By M. Vanderpol, of Lyons.

[A Paper read before the Société Technique du Gaz.]

The author began by pointing out that it is generally acknowledged that in burning a given gas with the object of producing the maximum temperature, it is necessary to use the minimum quantity of air; the proportion, in the case of coal gas, ranging from five to six times the volume of the gas. In order to take in, and mix with the gas, the air necessary for complete combustion, the method adopted is either that of suction by a chimney, or of pressure of either the gas or the air. As regards the taking-up of the air by the gas, the latter is one-seventh the volume of the mixture which it is required to produce; and as its density is about half that of the air, a given mass of gas is required to take up air to the amount of (say) thirteen times this mass. It will thus be understood that when using gas at the ordinary pressure this may not be an easy matter in practice; and the mixtures so made, even with the aid of the draught produced by a chimney, are not at all perfect. In order to produce a more certain and energetic draught of air, and a more perfect mixture of the latter with the gas, it has been the practice to use the gas at an increased pressure of from 1 to 2 metres of water. For two reasons, such high pressure is disadvantageous. In the first place, there is greater risk of leakage; and, secondly, the orifice from which the gas issues has to be of very small diameter.

Attempts have been made to bring the air and the gas together by means of the former, with results which have been good, though inferior to those obtained with compressed gas. This system, however, has the drawback of requiring a duplication of the mains supplying the burners—one set for gas, and another for the compressed air. Furthermore, in order to secure constant proportions of the two gases, both must be maintained at precisely the same pressure at the burner—a condition which is not easy to fulfil, if the consumption on the main is at the same time undergoing variations.

The third solution of the problem to which attention has of late been turned consists in previously mixing the air and gas in suitable proportions. This system has some advantages. First of all, a more intimate mixture of the air and gas is obtained; and next, if the whole quantity of air necessary for combustion is not introduced into the mixture, the pressure of gas required to take up the remainder is very small. Take, for example, the case of a mixture of one volume of gas with two volumes of air, or a mass represented by the figure 5. This is the quantity of "gas" available to take up the residual 8 parts of air, as compared with 1 part of pure gas required to take up (say) 12 parts of air.

Again, any loss of pressure will not alter the proportion of air to gas. From this, it would seem that as regards regular and perfect combustion this system of mixing the air and gas in the proportions to ensure complete combustion should give the best results. Such a mixture, however, could never be employed on account of its explosive properties, except under certain special conditions. The gas is used in admixture with three times its volume of air; and even with this proportion certain precautions are necessary. It is better to limit oneself to twice the volume as the maximum proportion in which the air is to be employed. The less the proportion of air, the higher the pressure at which the mixture is required to be used; but even with the air in the proportion necessary in practice—namely, 1½ times that of the gas—the pressures are not great.

The chief advantages of thus working with previously mixed air and gas under constant pressure are as follows: (1) In heating by gas on the large scale, absolutely constant calorific power is obtained. (2) The maximum temperature is produced in consequence of the freedom from excess of air. There is no cooling of the flame, and an excellent combustion results from the intimate mixture of air and gas. It is for this reason that the system affords such excellent results in incandescent lighting—giving one carcel-hour with 6 litres (0·21 cubic foot) of gas, or even less.

The author then proceeded to describe two forms of apparatus

in which the method of the prior admixture of air and gas is adopted. The first, invented by MM. Bouvier and Collon, is shown in fig. 1*. It consists of two pumps placed one above the other; the upper pump supplying the air, having three times the section of the lower one, which is used for the gas. In order to reduce the effect of the strokes of the piston at the outlet of the pump, the air and gas are taken separately into reservoirs, after traversing which they pass into an attachment fitted with hydraulic seals so as to prevent any possible striking-back of the flame, and mix at the entrance to the mains leading to the burners. A regulator is used to arrest the passage of air or gas to the reservoirs when the consumption reaches or falls below the normal supply of the pumps. This apparatus, named the "Calor," has met with useful application in the heating of laundry irons; it having been found to afford considerable saving of labour to the laundress in comparison with the charcoal closed stoves usually employed.†

The second apparatus, shown in figs. 2 and 3, is that devised by the Société Industrielle des Compteurs. Like the one just described, it adjusts the proportions of the gases, mixes them, and subjects them to pressure. Its principle, however, is entirely different. An iron tank is divided into two parts by a partition in the middle. In each of these sections, or in two separate tanks, is a drum resembling that of a gas-meter. Each drum can

* The apparatus has been patented in England, and has been described in the "JOURNAL." (See Vol. XCVIII., p. 593, and Vol. CI., p. 300.)

† This application of the "Calor" was on view in the vestibule of the hall of the meeting-place.—ED. J.G.L.

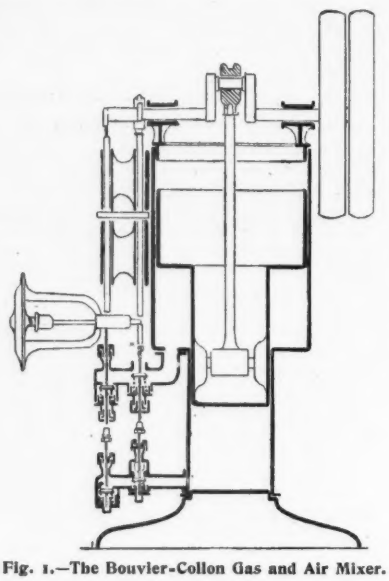


Fig. 1.—The Bouvier-Collon Gas and Air Mixer.

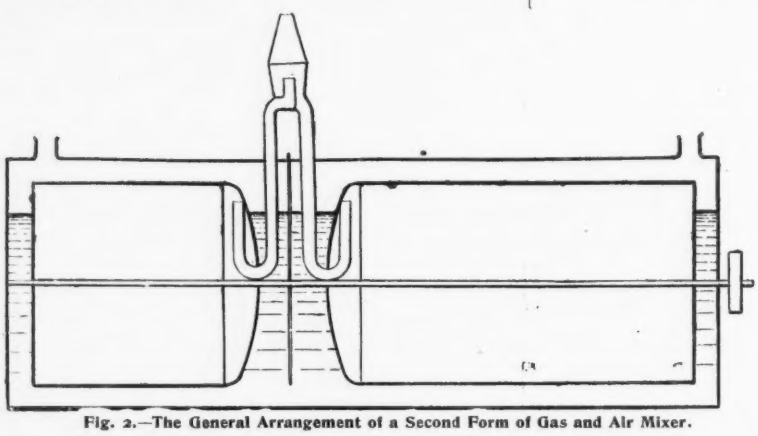


Fig. 2.—The General Arrangement of a Second Form of Gas and Air Mixer.

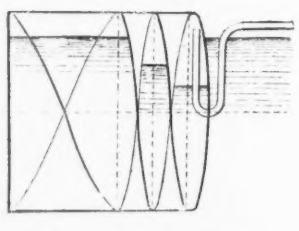


Fig. 3.—Section of the Drum.

be rotated on its axis by any convenient motive power—*i.e.*, an electric motor, a hot-air engine, or else a system of pulleys and a windlass, as in the case just described. The construction of the drums is as follows: The cylindrical capacity of the drum is divided into two by a division which is formed of two helicoidal surfaces soldered together. The surfaces are of different pitch—that of the second being smaller than that of the first. The drum is closed by a cap, and the compressed gas or air passes out by a syphon. Compression of the air or gas proceeds continuously; the level of the water between the two divisions falling according to the pressure attained by the air or the gas—that is, in proportion to the rotation. Further, the space in the drum which contains the compressed air or gas is limited by the fixed surfaces on the one hand and by the helicoidal surface on the other; so that its flow is constant, and does not give rise to variation in the pressure so long as the consumption continues. If this varies, a regulator placed at the outlet of the mixture reduces or increases the rotation to meet the requirements in the pipes—the composition of the mixture remaining unaltered. The power required for the apparatus is very slight. It can also be actuated by a weight; but, in order to avoid the numerous pulleys which have usually to be employed, a special device has been constructed, consisting of two pulleys provided with grooves, which agree with the diameters corresponding in turn to the speeds of displacement of the cord. The apparatus not only takes up very little room, but where there are only two axes to rotate they can be mounted on ball-bearings, with the result that the friction does not amount to more than 5 per cent. of the power transmitted.

REGISTER OF PATENTS.

Incandescence Bodies for Gas Lighting.

BÖHM, C. R., of Berlin.

No. 10,409; May 1, 1909.

Many attempts have been made, the patentee remarks, to utilize artificial silk for the manufacture of incandescence bodies for gas lighting—for instance, by adding the usual luminiferous salts to a collodion solution before it is formed into filaments. Another method consists in impregnating with luminiferous salts a fabric woven from artificial silk, after which the fabric is allowed to dry, then drawn through an alkaline bath (of ammonia) for converting the nitrate into hydroxides, and subsequently replacing the bath by a bath of hydrogen peroxide. However, as hydrogen peroxide converts only the thorium salt into a form insoluble in water, while leaving the cerium nitrate unchanged, this defect is remedied by the addition of organic acids or their salts. It was attempted also to produce the desired effect by simply impregnating the fabric woven from artificial silk, using first a colloidal thorium solution and then a solution of basic thorium salts. The "object of such treatment appears readily from the fact that the excess of nitric acid contained in every normal thorium nitrate has a destructive effect on the substance of the artificial silk."

The present invention starts from a recognition of this fact, and serves to simplify the manufacture of incandescence bodies from artificial silk.

Experiments have shown, it is pointed out, that the substance of the artificial silk is not only left uninjured, but is affected favourably, if instead of compounds of the luminiferous salts with inorganic acids compounds of the same with organic acids are used. Organic acids are all weak acids, and will not therefore destroy the artificial silk if employed in excess, as is the case, for instance, with nitric acid. Even insoluble compounds of thorium with organic acids may be employed for the impregnation of incandescence mantles of artificial silk, inasmuch as they are in most cases dissolved by a minute addition of an inorganic acid. In this case the inorganic acid always occurs in a chemically combined condition, and never as a free acid, as the stronger acid always drives out the weaker. This is important, because, as already mentioned, care must be taken in the manufacture of this class of incandescence bodies to avoid free inorganic acids—especially nitric acid.

There are a considerable number of solvents for sparingly soluble organic compounds of luminiferous earths. In the majority of cases they will not be used, however, because there exist also soluble salts of the said earths, which may be used with advantage for the impregnation of incandescence bodies from artificial silk. The woven fabrics, impregnated with organic acid salts of luminiferous earths, or with a mixture of organic and inorganic acid salts of luminiferous earths, are fixed, preferably, by subjecting them to an alkali bath or treating them with alkaline vapours, such as ammonia vapour.

If organic compounds are used for impregnating the incandescence bodies made of artificial silk, the slight addition of cerium may be left out of consideration and used in the form of a nitrate, as hitherto.

As the compounds of thorium and of the other rare earths with organic acids will rapidly hydrolize, this property may be utilized advantageously for the fixation or solidification of the impregnated fabric by means of peroxide of hydrogen. This reaction will, however, take a much more rapid course, if the artificial silk fabric is slightly impregnated with organic salts, instead of adding them to the hydrogen per-

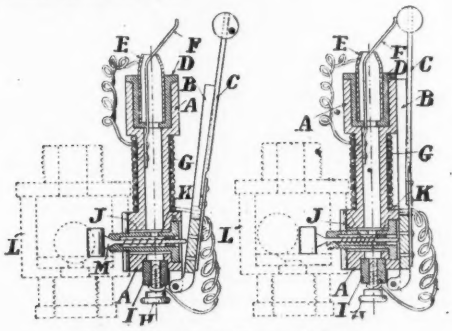
oxide. In selecting the particular salt, account must be taken of the fact that some organic compounds prevent the precipitation by means of hydrogen peroxide or ammonia.

Controlling the Supply of Gas and Igniting Same.

GIORGI, A., of Florence, Italy.

No. 12,470; May 26, 1909.

This invention relates to means for controlling the supply of gas to gas-burners, and also for igniting same, of the kind wherein an electro-magnet is provided with a double armature, one part of which actuates the gas-valve, while the other part actuates a contact so as to set up sparking which ignites the gas.



Giorgi's Gas Controller and Igniter.

A is the hollow core of the magnet, and B C the double armature—B being the fork-shaped part pivoted to the lower end of the hollow magnet core, while C represents the hammer portion, which is mounted on a spring secured to the lower end of the fork-shaped part. E is a socket or nozzle fitted at the upper end of the magnet core; being insulated from the core by the sleeve D. F is a spring rod of a non-oxidizable metal, extending through the nozzle E, and secured at its lower end to the inner surface of the core of the hollow magnet, while its upper end (which projects beyond the upper end of the nozzle E) is normally in contact with the edge or lip of the latter. G is the winding of the magnet; the upper end of the winding being connected to the nozzle E, while the lower end is connected to the binding screw H. The lower part of the core A is formed with a transverse passage J, fitted with a bush K in communication with the interior of the casing L (shown in broken lines) of the valve which controls the supply of gas, to the service-pipe of which it is fitted—the bush having mounted within it a rod M normally held in the inoperative position by a spring, and projecting at its outer end through the magnet A and into contact with the lower end of the part B of the armature.

Assuming that the gas is cut off and that it is desired to ignite a burner, the circuit containing the electro-magnet is closed by a controlling switch (not shown), whereupon current flows from the battery (also not shown) to the clamp H, thence, through the winding G, to the nozzle E, and through the spring rod F to the hollow core A, and thence to earth. The double armature B C is thereby attracted towards the electro-magnet; this movement of the double armature actuating the rod M so as to open the gas-valve and cause the gas to pass to the burner, and also, through the hollow core A, to the nozzle E. The part C of the magnet is attracted simultaneously with the part B; and its upper end strikes the end of the spring rod F, thereby pushing it out of contact with the nozzle E and breaking the circuit so that the elastic armature C recoils, and permits the circuit to be again completed. This operation continues as long as the controlling switch is on—thereby causing the armature C to vibrate and create a rapid succession of "makes" and "breaks," and, consequently, a succession of sparks between the spring rod F and the nozzle E. This sparking ignites the gas issuing from the socket E, and this serves to ignite the gas issuing from the main burner.

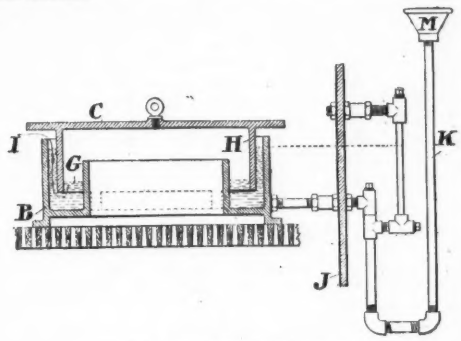
Gas-Purifiers.

MAY, T., of Richmond, Surrey.

No. 16,871; July 20, 1909.

This invention relates to purifiers in which horizontal grids are placed one above another (at some little distance apart) supporting purifying material; the gas introduced under the lowest grid rising through the interstices of successive grids and through the purifying material. It has been customary, the patentee points out, to provide automatic or other valves or bye-pass arrangements by means of which, when the pressure of gas below any grid becomes excessive in consequence of the resistance of the purifying material, a portion of it can be led into the space above the grid without passing through the purifying material in the usual way. The present invention is designed to provide a simple and effective automatic bye-pass characterized by the employment of a water seal, through which the gas can blow from the portion of the purifier below the grid when a certain pressure is reached or exceeded.

The apparatus comprises, firstly, a bell or cover provided with legs or supports, and with means whereby it can be lifted; and, secondly, an annular trough or flanged ring adapted to contain water, into which the edges of the cover dip—the legs of the cover resting upon the bottom of the trough. The trough holds sufficient water to resist a pressure equivalent to (say) 4 inches of water, in which case the rim of the cover will be immersed to a depth of 2 inches; the inner wall of the trough therefore rising at least 2 inches *plus* the depth of the legs of the cover. The outer wall of the trough may rise above the cover, so as to prevent the purifying material falling into the water, or the cover may overhang the outer wall. The depending flange of the bell is near the outer wall of the trough, so as to leave the greatest practicable area of water between the cover and the inner wall of the trough. The water is not found to evaporate to any appreciable extent; but, if necessary, the trough may be connected to means for refilling—such as a seal and tundish.



May's Gas-Purifier Bye-Pass.

Over the purifier grid shown is placed an annular trough B, containing water. The bell C has a number of downward extensions resting upon the bottom of the trough, two of which legs are indicated in dotted lines. The gas in the compartment below the grid has free access through it and through the open centre of the trough to the surface of the water at G, which surface is depressed by the pressure of the gas; the level of the water contained between the outer wall of the trough and the flange H of the cover being thereby raised. The pressure still increasing, the gas forces its way through the water seal and escapes, as indicated by the arrow I, into the compartment of the purifier next above the grid. The wall J of the purifier may be pierced to admit water from a pipe K, having a bend or seal to prevent leakage of gas, and a funnel or tundish M at the top, into which water can be poured. The upper opening of the pipe K should normally be plugged or otherwise closed, so as to prevent evaporation.

Gas-Fires.

YATES, H. J. (John Wright and Co.), of Aston, near Birmingham.

No. 17,920; Aug. 3, 1909.

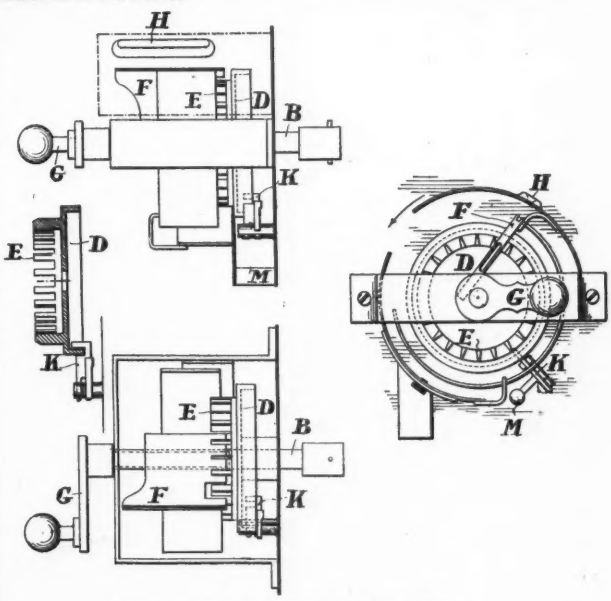
This gas-fire is of the "basket" type; and the invention comprises the employment (in conjunction with a frame or grate containing the refractory fuel and fire-brick back or lining, and adapted to be placed compactly within, and supported upon, the fire-bars of an ordinary coal-fire grate) of an adjustable cover-piece or fender capable of being extended or contracted vertically for enclosing the space beneath the gas-fire frame or grate and, if desired, of providing support to it.

Coin-Freed Meters.

GIBSON, T. S. F., and PALMER, W. V., of Old Kent Road, S.E.

No. 19,184; Aug. 20, 1909.

This invention has reference to coin-freed gas and other fluid meters, wherein, by turning a handle or by drawing down a lever after the insertion of a coin, the mechanism is actuated through the coin acting as a gag or bridge piece between the free handle and the mechanism attached to the meter.



Gibson and Palmer's Coin-Freed Gas-Meters.

The illustration shows just so much of a gas-meter as will suffice for present purposes (the meter proper being of the usual construction). It gives front, plan, and end views of the coin-freed mechanism; also the operating disc or wheel in section.

The mechanism is contained in a box fixed to the end of the meter

casing. B is the usual meter shaft extending into the box; and on it is keyed the flanged disc D, which has on its face dentals E. The shaft also forms a spindle upon which turns the sleeve C, to which are attached the coin-carrier F and the handle G. H is a slot in the top of the box as far as may be to the left from the end of the meter casing, and out of reach of the disc D. A coin inserted in the slot falls into the coin-carrier; and if it is of the proper size, it bridges the space between the carrier and the dentals of the disc and locks the two together, so that the disc can be rotated to operate the shaft of the meter by means of the handle. Stops are provided for limiting the movements of the coin-carrier in a rotary direction—one stop being, as usual, adjustable.

So far the mechanism does not differ from the operating mechanism usually employed in prepayment meters. It will be observed, however, that the form of the disc D is different—without the usual ratchet and pawl arrangement, which prevents "pumping" the apparatus to obtain fraudulently an extra supply of gas. To prevent the movement of the disc and the parts connected with it in a backward direction, there is a gripping plate or arm K, carried by a slotted post fixed to the end of the meter. The plate is formed with a forked end, which is passed into the slot of the post; being held in position by a pin and plate. The free end of the plate is notched to form jaws, which embrace the flange of the disc D. The plate is provided with means—such as the counter-weight M—to hold the plate normally in a position so as not to interfere with the rotation of the disc in the direction of the arrow. The plate, however, is so placed and adjusted that its jaws will immediately grip and bind the flange of the disc if the rotation of the disc in a backward direction is attempted. The binding action of the plate is instantaneous; and when free, it is perfectly silent, and puts no friction whatever on the disc when rotating forwards.

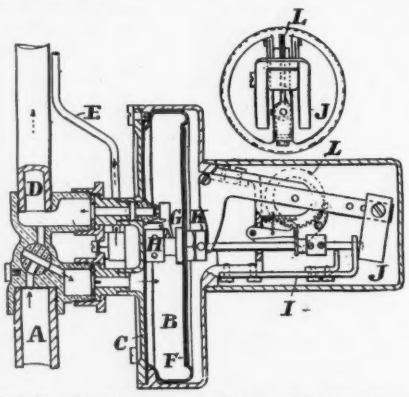
This absence of friction is claimed to be advantageous, inasmuch as the shaft B and disc D can rotate if the meter should continue to register beyond the predetermined extent owing to the non-closing of the valve or other defect in the mechanism. This rotation is usually prevented by the pressure of the ratchet mechanism spring, with the result that the gearing is in danger of being stripped by the continued action of the meter mechanism due to a leaky valve.

Operating Gas-Lamp Valves from a Distance.

M'Nab, N. S., of Caulfield, Victoria, and Link, J. S., of Melbourne.

No. 21,437; Sept. 20, 1909. Date claimed under International Convention, Sept. 25, 1908.

This mechanism for operating valves from a distance (and particularly intended for use in lighting and extinguishing gas-lamps) works electrically or by a temporary increase of fluid pressure or fluid pulsations. In its application to gas-lamps, the mechanism is adapted to extinguish or light simultaneously a series of lamps, or a cluster of burners, or to extinguish series of lamps or series of burners of a cluster before others of the series.



M'Nab and Link's Lamp Lighter and Extinguisher.

The gas is supplied to a pipe A provided with an ordinary or three-way cock, which admits the gas when opened into a chamber B through an opening in the valve plate C of the chamber. The plate has two outlet ports—one leading to the burner by way of the tube D, and the other by the tube E to the pilot light. The valves controlling the ports are connected by a gas-tight sensitive diaphragm F, and bellows or some like device in the chamber B cause pulsations of varying pressures of the gas introduced into the chamber. In the simplest form of construction for extinguishing or lighting all the burners at the same time, one valve is mounted on a pivoted lever G and kept normally closed by a spring, while the other is formed on a rod attached to, and operated by, the diaphragm. The other valve is closed by the direct action of the rod; and the one end of the latter and the valve are guided by a sleeve H, perforated to admit gas to one outlet valve, while the other end of the rod slides on the end of an arm I.

The diaphragm is under constant pressure by means of a weight J, which is slidably and adjustably secured to the end of a hinged lever, having an arm bearing against a block K secured to a rod outside the chamber B and within the casing of the mechanism. The rod is provided with an adjustable trip collar near its outer end, and has either a single or double flange, according to the effect desired, while the arm itself is provided with a stop to limit the outward movement of the collar and the rod.

Adjacent to the trip collar is a spring pawl pivoted on a rigid frame and adapted to engage with a ratchet toothed wheel L provided with notches of different depths and loosely mounted on a spindle. The ratchet-wheel is adapted to be partially rotated in one direction only by means of a pawl lever operated by the forward movement of the flanged trip collar. The pawl lever comprises a curved arm loosely mounted on the spindle and provided with a tension spring and a stop; while upon the arm is pivoted a spring pawl adapted to engage the teeth or notches of the ratchet-wheel. The notches between the teeth of the ratchet-wheel vary according to whether the mechanism is adapted to operate a single lamp or groups of lamps—such as street-lamps at different times, or a series of those provided with a cluster of burners.

The ratchet-wheel shown is adapted to operate a series of lamps each having a single burner, and all of which lamps are to be extinguished at the same time. Thus one series of notches are deeper than the alternating ones, and might be termed respectively the "releasing" and "retaining" notches. Thus when the pawl is in engagement with a shallow or retaining notch of the ratchet-wheel, it projects sufficiently to engage the flange of the trip collar on the rod, and prevents the backward movement of the diaphragm controlling the inlet valves; but when the pawl engages a deep or releasing notch it is out of the path of the flange, and so permits the weighted lever to operate and force the diaphragm back.

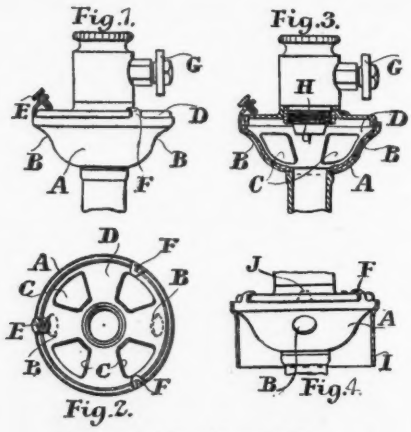
Assuming the valve on the lever G to be adapted to close the burner-port and the valve on the rod of the pilot-port, and assuming the burner is extinguished but the pilot alight, the pressure of gas being normal, the pawl will be in engagement with a shallow notch, and will retain the rod and diaphragm by projecting in the path of the flange of the trip collar—thus preventing the weight operating on the diaphragm. By now momentarily increasing the pressure, the flange will first move outwardly and operate against the arm of the pawl lever, thus rotating the ratchet-wheel L to the extent of one tooth; so that the pawl springs into a deep or releasing notch and allows the flange (which immediately returns) to pass, and the weight to operate on the rod and depress the diaphragm F. The effect of this is that the shoulder on the rod depresses the pivoted valve lever G against the pressure of its spring and opens the burner-valve, and approximately at the same time the pilot-light valve is closed. The burner is extinguished by another pulsation or momentary increase of gas pressure whereby the flange of the trip collar again moves outwardly and operates the pawl lever; thus turning the ratchet-wheel so that the pawl again engages a shallow notch and prevents the return of the diaphragm. The pilot-light valve is thus retained opened, while the burner-valve is closed by the spring of the pivoted lever to which it is attached.

Inverted Incandescent Gas-Burners.

Bland, C. W., of Little Trinity Lane, E.C.

No. 24,095; Oct. 20, 1909.

This invention relates to the air inlet chambers of inverted burners (both low and high pressure), and is specially designed for use in mills and other places where there is a quantity of dust or fluff in the air. The air-chamber is of the type in which the air enters from below, and, being closed on the top (preferably flat), has a saucer-like under case or portion which is of double form, and with which a shield outside the air-chamber may be used. The under side is provided with air inlet holes in both its inner and outer cases; one case being capable of movement upon the other, so as to cause the holes to more or less register with each other. The holes in both the inner and outer cases may be of any desired number; but it is preferred to use two only in the inner case, and to arrange them diametrically opposite to each other.



Bland's Dust-Proof Inverted Burner.

Fig. 1 shows the burner; fig. 2 is a plan with the top plate removed; and fig. 3 is a sectional view of fig. 1. Fig. 4 shows the application of a shield.

The under saucer-shaped case A has air-holes B (shown closed), which can be caused to more or less coincide with the apertures C in the inner case D. The case has lugs F, which are bent round the edge of the top flat part of the case, and one of the lugs is furnished with a set screw E. The shield consists of a plain ring of sheet metal I with a clip J. The finger piece G of the gas-regulating valve controls the needle part H in the usual manner.

It will be obvious that falling particles of dust cannot be easily drawn through the holes B, because they are under the cover D; and when the shield I is used, the dust would have to follow a circuitous direction to reach the holes.

Gas-Meters.

Morris, H. J., of New Britain, Conn., U.S.A.

No. 25,867; Nov. 9, 1909.

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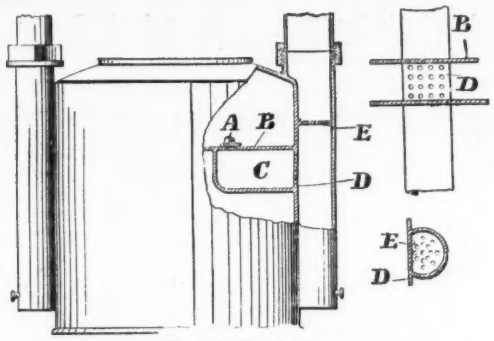
the recording or registering mechanism within the meter for the purpose of permitting a flow of gas without being registered." In the meter outlet-pipe, baffle plates are disposed to prevent tampering with the meter.



Morris's Gas-Meter.

The registering mechanism of the meter (not shown) is adapted to control a valve A, forming a closure for a valve-port, contained in a horizontal partition B, within the meter. This port leads to a bye-pass chamber C within the meter and in communication with the outlet pipe through a number of openings formed in the vertical wall D of the meter. These openings are of a size to prevent the insertion of a hook instrument or even a bent wire, although allowing the passage of gas from the meter to the outlet pipe. Above the openings, and within the outlet pipe, is a "horizontal foraminous baffle-plate" E, the apertures in which are of a size to prevent the passing of a wire or other instrument through it to the valve A, to open it and allow a flow of gas from the meter without being registered.

Removing Tar from Hot Gases.

Otto and Co., G. m. b. H., of Dahlhausen a/Ruhr, Germany.

No. 26,124; Nov. 11, 1909. Date claimed under International Convention, Dec. 22, 1908.

In their complete specification, the patentees say: It has been recognized that the most economical method of recovering ammonia from gases (coking-ovens, gas-retorts, or the like) consists in obtaining ammonium sulphate direct by passing the gases through sulphuric acid strong enough to determine the separation of the ammonium sulphate as crystals as soon as it is formed. For the success of the method, it is essential that the tar should be removed from the gases as completely as possible before the gases pass through the sulphuric acid, and that the temperature of the gases and the sulphuric acid should be high enough to prevent condensation of the aqueous vapour in the gases, and thereby the dilution of the sulphuric acid. The best mode of removing the tar has been shown to consist in scrubbing the gases with tar or ammoniacal liquor containing tar, or with ammoniacal liquor alone, since this speedily becomes tarry; and the best mode of applying the tar or tarry liquor is by spraying apparatus, preferably an injector, as described in patent No. 12,809 of 1908. It has been pointed out that the temperature of gases of this kind from which tar is to be separated by a tar spray should exceed 40° C.; and it has been stated that the higher the temperature above this limit the better, when the recovery of ammonia is in question—the best temperature being between 100° and 200° C.

Now, according to the present invention, for the successful working of the scrubbing agent, the latter should have a temperature not exceeding 80° C., and not substantially below 85° C. It follows that the temperature should be maintained as near 85° C. as may be without exceeding this degree. If this temperature be adopted, the gas remains sufficiently hot for direct precipitation of all the ammonia it contains.

There are various modes, it is pointed out, of ensuring that the temperature shall not exceed the limit named. Thus, care may be taken that the temperature of the gases at the time they are scrubbed with the tar is such that the temperature of the latter cannot exceed 80° C., although in this case there is some danger that the content of steam in the gases may lead to incomplete precipitation of the ammonia as sulphate. Another mode is to supply the scrubbing agent in such proportion that the temperature cannot exceed the limit.

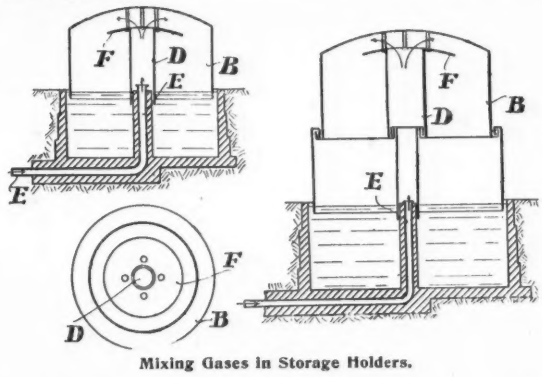
Gasholder.

Ofenbau G.m.b.H., of Munich.

No. 27,278; Nov. 23, 1909. Date claimed under International Convention, Dec. 7, 1908.

This invention relates to a device for filling gasholders in the manufacture of illuminating and water gas; the object being to obtain a gas of as far as possible uniform constitution by its being introduced at or near the top of the holder. A telescopically displaceable feed pipe, open at the top and connected at the bottom with the gas-supply pipe, is suspended from the top of the bell of the holder, so that the gas introduced must flow along the top of the bell in any position of the latter.

The patentees here remark in their specification: Now, if a specifically heavier gas be periodically or temporarily introduced into the gasholder, it will, after escaping from the feed-pipe opening at the top of the holder, be thoroughly mixed with the gas already contained in it by falling downwards, whereby a uniform composition of the stored gas is afforded. This thorough mixing of the gas may be further facilitated by the gas on its exit from the feed-pipe into the holder being distributed laterally over a large part of the section of the holder by means of a shield surrounding the upper mouth of the feed-pipe. They point out that they are aware that it has previously been proposed in small gasholders for use in connection with compressed-gas consuming plants to have a tube connected with the dome of the bell and slidable over the central gas-supply pipe; the lower end of the tube being formed to act as a valve to regulate the admission of gas, and the upper end having outlet apertures into the bell. In this arrangement, as the tube serves to carry the valve for controlling the admission of gas it has only a very limited movement, and the arrangement is quite inapplicable for the purposes of the present invention to the large gasholders at gas-works.



Mixing Gases in Storage Holders.

To the dome of the single-lift gasholder bell B, a downwardly extending pipe D is attached, preferably in the middle, by stay bolts or other suitable means. The top of the pipe is a little below the dome, and the bottom projects below the mouth of the gas inlet pipe E, over which the pipe D slides. The pipe D rises and falls with the bell of the holder, sliding up and down over the inlet pipe; so that the inflowing gas must always rise to the top of the bell. If the gas introduced by the feed-pipe D at the top is heavier than that already contained in the holder, it will, of course, sink downwards, and "thereby become intimately mixed with the gas already accumulated." In order that the gas thus introduced may not be able to flow down the sides of the pipe D, a shield-like disc F is provided (at the upper end of the pipe), over which the gas flows; so that it must mix intimately with the gas in the holder. For a telescopic holder with two or more lifts and so-forth, the gas-supply pipe is made suitably telescopic, as shown.

APPLICATIONS FOR LETTERS PATENT.

14,242.—Kirkby, R., "Valves for gas-furnaces." June 13.
14,273.—Behringer, E. A., "Gas-main stoppers." June 13.
14,304.—Société Française de Matériel Agricole et Industriel à Vierzon, "Gas-generators." June 14.
14,405.—Koppers, H., "Gas-furnaces." June 14.
14,426.—Ellin, A. H., and Atkinson, D., "Hot-plate." June 15.
14,458.—Ruscoe, A. O., "Inserting valves in gas-mains under pressure." June 15.
14,478-9.—Hartmann, W., "Explosion-engines." June 15.
14,480.—Smallwood, J., "Switches for controlling gas-burners." June 15.
14,492.—Julius Pintsch Akt.-Ges., "Ignition-device for inverted incandescent gas-lamps." June 15.
14,599.—Knapp, H., "Acetylene generator." June 16.
14,629.—Batty, J., and Coates, F., "Gas-ring." June 17.
14,681.—Robson, G., "Automatically operating gas-burners." June 17.
14,686.—Enderson, S. J., "Pumps and blowers." June 17.
14,701.—Bennis, E., and Bibby, J., "Valves." June 18.
14,737.—Southey, A. W., "Generating gas." June 18.
14,757.—Knapp, H., "Purifying acetylene gas." June 18.
14,768.—Stainer-Hutchins, T. W., "Gas-producer generators." June 20.
14,809.—Tucker, T., "Meter money-boxes." June 20.
14,825.—Rawlings, J., "Globe holder." June 20.
14,828.—Lamplough, F., "Exhauster and blower." June 20.
14,839.—Bradley, G., "Pipes." June 20.
14,897.—Dor-Delattre, E., "Retort making." June 21.
14,902.—Joseph, J. E., "Pipe-joints." June 21.
14,950.—Julius Pintsch Akt.-Ges., "Incandescent gas-lamps." June 21.
15,036.—Brougham, F. J., "Manufacture of ammonium sulphate." A communication from Solvay et Cie. June 22.
15,081.—Helps, G., "Gas lamps and burners." June 23.
15,196.—Ainley, L., "Anti-vibrator." June 25.
15,255.—Brown, A. A., "Mantle boxes." June 25.
15,290.—Cloudsley, J. L., "Two-stroke internal-combustion engines." June 25.

At the twentieth annual meeting of Head, Wrightson, and Co., Limited, Sir Thomas Wrightson, who presided, said the result of the past year's working was somewhat more favourable than that of 1908-9, when they had to dip into the reserve fund. This year, after paying interest on debentures and preference shares, the amount carried forward was £2563, or over £2000 more than they carried forward last year. Having regard to the short period that their South African branch had been established, the turnover had been considerable; and a satisfactory footing had been obtained in this important market. Taking the balance-sheet as a whole, it was an improvement upon 1909, though the Directors considered the improvement was insufficient to allow them to declare a dividend on the ordinary shares. Whether the fierce competition which was crushing market prices below actual costs was to be mitigated during the current year remained to be seen.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Coalite Company and Their Process.

SIR,—I have observed in your last issue a letter in regard to the "Coalite Process," in which it is suggested that the claim to the Coalite patent has been knocked on the head by an opposition brought by the Coalite Company against a pending application in the Patent Office.

As it may possibly be a matter of interest, might I point out that this could hardly be correct; for under section 11 of the Patents and Designs Act, 1907, the opposition would be made on the ground that the invention claimed had been patented in this country on an application of prior date.

I have looked up the claims on the application that is apparently referred to, and they read as follows:—

1. In a process for obtaining a smokeless free-burning fuel by coking at a low temperature, subjecting the charges of coal contained in externally heated retorts to the action of watery vapour or steam introduced into the retorts during the whole of the coking process for the purpose described.

2. In the process forming the subject-matter of the foregoing claim, the addition to the coal to be treated of tar or other hydrocarbon, as and for the purposes set forth.

3. In the process forming the subject-matter of the foregoing claims, the addition to the coal of salts of alkalis, such as sodium or potassium nitrate, chloride, or hydrate, as and for the purposes described.

Unless the Coalite Company actually and expressly claimed the use of steam throughout such a process, and the use of tar, or salts of alkalis in such a process, or point to patents covering this identical subject-matter, they could not prevent the grant of a patent on the application. But if the process claimed were used in the Coalite process, by anyone other than the Coalite Company, this is a matter of infringement that could only be dealt with in the Law Courts, where alone such a decision could be given, if at all.

Further, in such opposition proceedings, the question whether the claim on the application involved good subject-matter for a patent could not be contested; but the grant would be allowed whether the claim were good or bad, and so long as there were no prior patents in which the subject-matter had been actually and expressly claimed.

Hornsey Rise, N., June 30, 1910. GEORGE HAM, B.Sc. (Lond.).

High-Pressure Gas Systems.

SIR,—Will any brother gas manager kindly state through your columns whether he has found that lead joints are satisfactory for high-pressure mains? Also, considering the present and future traffic likely to be experienced on our highways, will this method of jointing withstand the vibration unless laid at abnormal depths?

Hoping some managers will be good enough to give their experience.

June 27, 1910. PROVINCIAL GAS MANAGER.

Utilization of Waste Gases.

The Lord Chairman of Committees (Lord Onslow) had before him last Tuesday the Bill of the Little Hulton Urban District Council, which authorizes the transfer of so much of the gas undertaking of the Salford Corporation as is within the Council's area, and empowers the Council to supply gas in their district. It may be remembered that it is proposed to utilize for the first time the waste gases from coke-ovens for the purpose of a public supply of gas. Under an agreement scheduled to the Bill, Lord Ellesmere contracts to supply the Council annually with not less than 8 million cubic feet of gas from his coke-ovens, the gas from which is at present running to waste. The agreement, which is for 35 years, may be determined after this period by either party giving five years' notice; and in this event, the Council are to have the option of purchasing Lord Ellesmere's gas plant. [The proceedings on the Bill in the Lower House were reported in the last volume of the "JOURNAL," pp. 53, 126.] His Lordship passed the Bill; and it was ordered to be reported. This stage was subsequently passed.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale, by order of Directors, a new issue of capital of the Chigwell, Loughton, and Woodford Gas Company. It consisted of £2000 of consolidated ordinary stock and £1000 of 4 per cent. perpetual debenture stock. The former ranked for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; but the dividend on similar stock for the four years ended Dec. 31 last has been at the rate of 5½ per cent. per annum. It was all sold at £125 to £126 per £100; the debenture stock fetching £102 to £102½ per £100. On the same occasion, Messrs. Richards sold a few £5 "B" shares in the Pinner Gas Company, Limited, ranking for a standard dividend of 7 per cent., subject to the sliding-scale, but carrying £8 8s. per cent., at £9 to £9 5s. each. New 7 per cent. stock (1881) of the Brentford Gas Company, carrying 9½ per cent. dividend, fetched £188 to £192 10s. per £100. The final lots offered consisted of 3½ per cent. "B" stock of the Ilford Gas Company, carrying a dividend at the rate of 5½ per cent. per annum; and it was sold at £116 to £116 10s. per £100. At the Royal Hotel, Norwich, last Tuesday, Messrs. Spelman sold, under instructions from executors, ten fully-paid original shares of £10 each in the Fakenham Gas Company, Limited, for £7 15s. apiece.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Middlesbrough Corporation Bill, Pontypridd and Rhondda Joint Water Board Bill, Shirebrook and District Gas Bill.

Bills read a second time and committed: Bradford Corporation Bill, Bristol Gas Bill, Middlesbrough Corporation Bill, Pontypridd and Rhondda Water Board Bill, Slough Water Bill.

Bills reported, with amendments: Brighton and Hove Gas Bill, Bristol Gas Bill, East Grinstead Gas and Water Bill, Egremont Urban District Council (Gas) Bill, Exmouth Gas Bill, Gas Orders Confirmation Bill (No. 2), Exmouth Urban District Water Bill, Little Hulton Urban District Council Bill, Worksop Urban District Council Bill.

The Bradford Corporation Bill, Gas Orders Confirmation Bills (Nos. 1 and 3), Water Orders Confirmation Bill, Middlesbrough Corporation Bill, Mountain Ash Water Bill, Pontypridd and Rhondda Joint Water Board Bill, and Rhondda Urban District Council Bill, have been referred to a Select Committee, consisting of Viscount Hutchinson (Chairman), Lord Sempill, Lord Middleton, Lord Ellenborough, and Lord Wynford; to commence sitting to-day.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Great Grimsby Gas Bill, Havant Gas Bill.

Bills reported: Cambridge University and Town Water Bill [Lords], Garnant Gas Bill [Lords], Kingswood Water Bill [preamble not proved], South Lincolnshire Water Bill [Lords], Water Provisional Order (Sutton) Confirmation Bill.

Bills read the third time and passed: Bishop's Stortford, Harlow, and Epping Gas and Electricity Bill [Lords], Pontypridd and Rhondda Joint Water Board Bill, Rhondda Urban District Council Bill, Shirebrook and District Gas Bill, Southend Water Bill [Lords], Thorne and District Water Bill [Lords], and the Water Provisional Order Bill.

The petitions of the Wealdstone Urban District Council and the Wolverhampton Corporation against the Gas Companies (Standard Burner) Bills have been withdrawn.

Last Wednesday, Sir J. D. Rees asked the President of the Local Government Board whether the Government proposed to introduce legislation this session restricting the borrowing powers of local bodies. Mr. Burns having replied in the negative, Mr. Bowles asked the right honourable gentleman if he was aware that the aggregate debt of the local authorities of the United Kingdom very nearly equalled the funded National Debt. Mr. Burns said he was aware of the fact; but he added that there were assets to which he would direct the attention of the honourable member.

On Friday, Mr. Fell asked Mr. Burns if he had received any complaints with regard to the quality of the water supplied during the past year by the Metropolitan Water Board to consumers in the borough of Wimbledon—that such water contains an excessive amount of chalk or lime; and if he would have such water specially tested and reported upon. Mr. Burns replied that no complaints had reached him. He was aware, however, that the water now supplied to certain parts of Wimbledon was obtained from wells, and that it was harder than the river water which was previously distributed. In view of the regular analyses of the water by Dr. Houston for the Metropolitan Water Board, it did not appear necessary that any further ones should be made.

LOCAL AUTHORITIES AND PROVISIONAL ORDERS.

Consents Dispensed with by the Board of Trade.

Three reports have lately been presented to the House of Commons by the Board of Trade, pursuant to section 4 of the Gas and Water Works Facilities Act, 1870, setting forth their reasons for dispensing with the consents of local authorities in the cases of certain applications for Provisional Orders in the present session.

Rowley Regis and Blackheath Gas Order.

The Board of Trade report that they have made the Rowley Regis and Blackheath Gas Provisional Order, and have dispensed with the consent of the Cakemore Parish Council, who are the Local Authority within the extended limits of supply to be authorized by the Order, and also with the consent of the Halesowen Rural District Council, who are a road authority within the extended limits.

The application for the Order was made by the Rowley Regis and Blackheath Gas Company, who sought power to supply gas in the township of Cakemore, in the county of Worcester, and to raise additional capital not exceeding £12,500 by shares or stock, with borrowing powers not exceeding one-third of the authorized capital of the Company. The promoters having failed to obtain the consent of the Local Authority and of one of the two road authorities concerned, the Board decided to hold a local inquiry into the application for the Order and the objections which had been lodged thereto; and they appointed Mr. Raymond Asquith as Commissioner for the purpose. The Parish Council were not represented at the inquiry; but it appeared that their consent had been refused on the ground that the granting of the Order would invest the promoters with a monopoly of the gas supply in Cakemore. It was stated that portions of the parish are supplied with gas, but not under statutory powers, by the Halesowen

Gas Company and the Oldbury Urban District Council; but neither of these bodies objected to the granting of the Order.

It appeared from a petition praying that the Order might be granted, and signed by upwards of 200 householders, ratepayers, and gas consumers of Cakemore, that the promoters had supplied gas in the parish for over thirty years, and that the Parish Council had entered into a contract with them for the supply of gas to public lamps.

The Halesowen Rural District Council urged two objections to the Order: (1) That the Council hoped shortly to become an Urban District Council, and might then desire themselves to supply gas in Cakemore. (2) That, as the Rowley Regis Urban District Council have power, under the Rowley Regis and Blackheath Gas Act, 1886, to purchase the undertaking of the promoters, the Council might acquire power to supply gas in Cakemore, and that this fact might be used to further a proposal to detach the parish from the Halesowen rural district and attach it to the Rowley Regis urban district.

With regard to these objections, it appeared that already two applications for urban powers made by the Halesowen Rural District Council have been refused by the Worcester County Council; that six out of the nine parishes in the district objected to the application; and that the township of Cakemore has applied to be included in the adjoining urban district of Oldbury.

The Commissioner reported that, in his opinion, having regard to the whole of the evidence, and especially to the fact that no inhabitant of Cakemore has a right at present to require a supply of gas from any existing company or authority, the Order should be granted. The Board of Trade accordingly decided to dispense with the consents of the two authorities concerned, and to grant the Order.

Sutton District Water Order.

The Board of Trade have to report that they have made the Sutton District Water Provisional Order, and have dispensed with the consents of the Kingswood Parish Council, the Reigate Rural District Council, and the Surrey County Council.

The application for the Order was made by the Sutton District Water Company for power to supply water in the parish of Kingswood in the county of Surrey, to maintain and continue existing waterworks, and to construct new works. The promoters having failed to obtain the consent of the local and road authorities concerned, and objections having been lodged by the Kingswood Water Company, Limited, an inquiry into the application for the Order and the objections which had been lodged thereto was held on behalf of the Board of Trade. The Kingswood Water Company were represented, and opposed the application on the ground that they are themselves promoting a Bill in Parliament for the purpose of obtaining statutory power to construct water-works and supply water in the parish of Kingswood. An application by the Company for a Provisional Order to authorize them to construct works and supply water in the parish of Kingswood was refused by the Board of Trade in the session of 1909.

It appeared that the promoters are supplying water in the northern part of the parish, and that the Kingswood Water Company are serving the southern portion. Neither the promoters nor the Company, however, have statutory powers to supply in the parish. The Kingswood Parish Council were not represented at the inquiry, and appear to have adopted a neutral attitude as regards the two schemes. The Reigate Rural District Council were represented by one of their members, who gave evidence that the Council were opposed to the granting of the Order. The Surrey County Council did not express any opinion as to the merits of the schemes, but desired the insertion in the Order of a clause for their protection, to which the promoters did not agree. It appeared from the evidence that the promoters of the Order were in a position to give an adequate supply of water to the whole of the parish of Kingswood.

In view of all the circumstances of the case, the Board of Trade decided to grant the Order, and to dispense with the consent of the authorities concerned.

Swansea Gas Order.

The Board of Trade have to report that they have made the Swansea Gas Provisional Order, and have dispensed with the consent of the Llansamlet Parish Council, the Clase Rural Parish Council, the Penderry Parish Council, and the Cockett Rural Parish Council, who are Local Authorities in the extended limits of supply authorized by the Order, and of the Swansea Rural District Council and the Glamorgan County Council, who are road authorities in the extended limits.

The application for the Order was made by the Swansea Gas Company, who sought power to extend their limits for the supply of gas. The promoters having failed to obtain the consent of the local and road authorities concerned, an inquiry was held on behalf of the Board of Trade into the application for the Order and the objections which had been lodged thereto.

It was stated that the Local Authorities had refused their consent to the application except on the condition that the price of gas in the added area of supply should be the same as that charged in the existing area. It appeared, however, that a considerable part of the added area is sparsely populated, and, being a much undermined colliery district, it was anticipated that there would be considerable leakage from the mains. In their existing area outside the limits of the borough, the promoters are already entitled to charge, and in some parts thereof do in fact charge, a higher price than within the borough. In these circumstances, the Board of Trade decided to allow a maximum price in the added area higher by 4d. per 1000 cubic feet than the price charged for gas within the borough of Swansea.

The Swansea Rural District Council also asked for the insertion of a clause requiring the promoters to lay certain specified mains; but the Board of Trade did not consider it desirable to insert it. The Glamorgan County Council, who were not represented at the inquiry, were understood to desire the insertion of a clause for their protection; but, following the usual practice of the Department, the Board decided not to insert the clause in the absence of agreement between the parties—protection being already afforded to road authorities under the Gas-Works Clauses Acts, which are incorporated with the Order.

Having regard to all the circumstances of the case, the Board of Trade were of opinion that the Order should be granted, and the consent of the authorities concerned dispensed with.

GLASGOW GAS CONSOLIDATION BILL.

House of Lords Committee.—Monday, June 27.

(*Before the* DUKE OF BEDFORD, *Chairman, the Marquis of* BRISTOL, *Lord* BASING, *Lord* DIGBY, *and the Earl of* WESTMORELAND.)

This Bill, which provides for the consolidation of the Glasgow Gas Acts from 1869 to 1909; for the reduction of the illuminating power of the gas supplied by the Corporation to 14 candles; and for other purposes, came up for consideration to-day.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., and Mr. H. BEVERIDGE appeared for the promoters. The petitioners against the Bill were: Bailliesto Gaslight Company, represented by Mr. BLENNERHASSETT, K.C.; Thomas Clement and Andrew Clement, by Mr. CRAIG HENDERSON; Mr. Wm. C. S. Stuart, by Mr. CRAIG HENDERSON; Mr. Alexander Crum Maclae and the Trustees of the deceased John Miller, by Mr. CRAIG HENDERSON; the Lanark County Council, by Lord ROBERT CECIL, K.C., Mr. J. WILSON, K.C., and Mr. J. E. KING; the Town Councils of Govan, Partick, Rutherglen, and Pollokshaws, by the Hon. J. D. FITZGERALD, K.C., Mr. FREEMAN, K.C., and Mr. W. B. CLODE; the Caledonian, Glasgow and South Western, and North British Railway Companies, by Mr. FORBES LANKESTER, K.C., and Mr. CRAIG HENDERSON; the Glasgow House Owners Association and others, by Mr. VESEY KNOX, K.C., and Mr. W. SZLUMPER; manufacturers, engineers, and others within the gas supply area of the Glasgow Corporation, by Mr. LEWIS COWARD, K.C., and the Hon. E. CHARTERIS. There were petitions with regard to which Counsel was reserved from the County Council of Renfrew, and the Dumbarton, Milngavie, and Clydebank Town Councils.

Mr. BALFOUR BROWNE, in opening the case for the Bill, said that the Acts they were seeking to consolidate were some 19 or 20 in number; and certain amendments were to be made, most of which were unopposed. Going back to the year 1869, the Corporation had long felt that the supply of gas should be in their hands; and in that year, the two gas undertakings in the Glasgow district were transferred to them. Since then, the supply had been in the hands of the Corporation. As a condition of the purchase, Glasgow was bound to supply the whole area with gas, and to every person within 50 feet of the mains who wished to have a supply. They were under this obligation to-day. Under the Purchase Act, they had to pay annuities of £27,000 to one Company, and £7762 to the other; and the Corporation also took over the mortgage debt of the two Companies, which amounted to £192,000. The Corporation had to be liable for the whole risks of the undertaking; and they became liable to a guarantee rate of 6d. in the pound if the revenues from the gas undertaking were insufficient. This guarantee rate fell upon the City of Glasgow, and not upon the area of supply. New works were erected, and still the demand went on increasing. At the present time, the capital expenditure of the works was £3,841,282, exclusive, of course, of the annuities of £34,762. By their Act of 1869, the price to be charged was 4s. 7d. per 1000 cubic feet; and the quality of the gas was 25 candles. In 1882, the candle power was reduced to 20 candles, and later to 16 candles, at which it stood to-day. In 1869, the amount of gas manufactured was 1206 million cubic feet; it was now 6820 millions. The price of gas had been gradually reduced until it was now 2s. per 1000 cubic feet. They had the right to apply the surplus of their gas profits to the general purposes of the Corporation, which was not at all an uncommon thing. Birmingham were making out of their gas undertaking £71,000 a year, which was applied to the reduction of the charges on the ratepayers, But Glasgow had carried very little indeed to the relief of the rates. During the whole period the Corporation had had the works, only £21,000 had been transferred to the general fund. In 1871, the Partick, Hillhead, and Maryhill Gas Company were started, and supplied one part of the area given to Glasgow in 1869. The Corporation resented the unfair competition of the Company, which was not a statutory concern; and when they came to Parliament for powers in 1873, their Bill was rejected on opposition by Glasgow. In 1890, the Company again sought parliamentary powers—meanwhile having purchased another Company for a sum of £11,000. This Bill was also rejected on the opposition of the Corporation of Glasgow. In 1891, Glasgow promoted a Bill to include within its municipal area Maryhill and some other districts. In the same year the Maryhill Company again promoted a Bill for statutory powers; but Glasgow agreed to purchase their undertaking for £202,500. The Corporation also purchased the Milngavie Company and other gas companies. To-day, their district covered 98 square miles. From east to west it extended 15¾ miles, and from north to south 11¾ miles. There were new provisions in the present Bill, to give certain discounts, to reduce the quality of the gas to 14 candles, the fittings were not to be subjected to distress, and to give the use of anti-fluctuators. With regard to these matters, however, he did not think there was any opposition. They were proposing to define their limits of supply, and divide the limits into two districts—the City supply and the supplementary supply. It was proposed at first that Milngavie should not be in the City supply; but in the Lower House it was decided that it should be, and no point now arose upon this. With regard to clause 2, which incorporated the General Acts, the opposition was mainly, if not entirely, confined to the county of Lanark, who said the General Law was not sufficient, and asked for special clauses to be put upon the Corporation. But he would point out that there was no case in which the general law had been varied, except by agreement. Clause 6 defined the City supply district, and the only part, so far as he knew, where it was not absolutely limited was in the parish of Cadder. There was a Company who had not got mains in either Mearns or Carmunnock who opposed them in the other House with a view to compelling the Corporation to buy their whole undertaking. The Corporation refused to purchase; but desired then and now to continue the supply they were giving in the two parishes. The House of Commons Committee, however, decided that the Corporation should not go on supplying there unless they purchased the Busby Gas Company; and therefore these parishes were left out. However, there were people petitioning against the Bill and saying that they wanted a supply of gas from Glasgow. But he must fully acquiesce in the decision of the House of Commons; and it was for the present Committee to say

whether Glasgow was to go on supplying these districts or not. Before the Bill went into the other House, the Corporation entered into negotiations with the Baillieston Gas Company, in the parish of Old Monkland, and agreed that, if they were put in the supplementary supply area, where the Corporation could charge a higher price than in the City area, they would purchase their works for £10,000. It was decided, however, by the Committee that they were to be in the City supply area; and the bargain was therefore off. He was quite content either that it should be where it was before, in the supplementary area, or to have it struck out altogether. It did not matter to the Corporation which took place. Clause 26 had reference to the price of gas. In the House of Commons, as they brought up the Bill before the Committee, the price to be charged by the Corporation was not to exceed the maximum of 4s. 7d. They might charge a differential rate as between gas supplied and used for private lighting purposes and that employed for other purposes; and in the case of gas supplied for such other purposes, the rate to be charged was not to exceed that charged for private lighting, but might be such as should be agreed upon. In the supplementary supply district, the Corporation might charge rates higher than those charged within the City area. These rates might vary in different parts of the supplementary supply area, but should not at any time exceed the maximum. As the clause was introduced into the Lower House, it gave the Corporation power to vary the price to consumers under different circumstances—they were only to charge the same under like circumstances. But the House of Commons Committee, after hearing a number of witnesses, came to the conclusion that a flat-rate should be charged, and the price was not to exceed the maximum of 4s. 7d. They must treat every consumer for trade purposes exactly the same, even although the circumstances might be entirely different. The Committee seemed to think that if the Corporation were to trade, they were not to trade for any profit, and that they were not to differentiate between one customer and another. He must acquiesce in the clause; but he found that several of the opponents of the Bill were now there to insist that this was not a fair clause, and he would take no part whatever in the discussion. He brought up the clause as it left the Lower House. He thought the Bill as it now stood was a better one for the Corporation than the existing legislation; and if the Committee passed it as it left the House of Commons, he would be content. At the present time, in consequence of section 9 of the Glasgow Corporation Act, 1882, which it was proposed to repeal (read in connection with the Glasgow Corporation Act of 1859), there was a flat-rate to all consumers of gas supplied by the Corporation; there was the same rate for public lamps; and there was no differentiation of gas for industrial purposes. As the Bill stood, there was a flat-rate within the City district for gas supplied by the Corporation; a flat-rate for public lamps, which need not be the same as the flat-rate for the gas supplied by meter; a lower rate for gas supplied for trade purposes, and a different rate according to the purpose for which the supply was required; and higher rates in the supplementary supply district than those charged in the City supply district. This was as the Bill left the House of Commons; and he was perfectly willing to acquiesce in it. He thought the Corporation would be in a better position if the manufacturers and others succeeded in modifying the clause so as to enable the Corporation to reduce the price of their gas to large consumers. The only other clause in the Bill to which any objection was taken was clause 50. It was urged that the lamps along the canal towing-path should be put on the same basis as public lamps. This the Corporation absolutely refused to do, because they were private lamps belonging to the Railway Company. The clause provided that the Corporation were to apply all moneys from time to time received by them under the powers of this Act.

(1) In payment of the expenses of, and incidental to, the raising, levying, and recovering the rents, charges, and revenues, and the borrowing of moneys for the purposes of this Act; (2), in payment of the expenses of managing and maintaining the gas undertaking; (3), in payment of the annuities and interest on money borrowed for the purposes of this Act; (4), in carrying the several powers and provisions of this Act into execution, including any improvement and extension of the gas-works and mains; (5), in providing the sum necessary to meet depreciation at not exceeding the following rates—on gas-works, at 1½ per cent. per annum; on pipes, at 2 per cent. per annum; on meters, at 6 per cent. per annum; on stoves, at 10 per cent. per annum; and on premium, at 2½ per cent., which rates were to be calculated on the book values of the respective assets on May 31, 1906, together with the net additions to such assets subsequent to that date, and any balance remaining should be carried forward to the revenue account of the gas undertaking for the next succeeding year, and should, whenever there should be an amount sufficient for the purpose, be applied to the reduction of the gas charges equally throughout the limits of supply.

The effects of this section was to prevent them making any profit whatever out of their gas undertaking. They were the owners of it, and had taken all the risks in regard to it; but the Committee of Parliament had said, notwithstanding this, that they were to conduct it, in the words of the Socialist, "not for profit, but merely for use." He must take the Bill if their Lordships passed it; but there were a large number of opponents there who said that this was entirely wrong. If the Corporation were to make a dead loss on their undertaking, as was quite possible, who was to pay? Not the people in the outlying districts, but the citizens of Glasgow. They stood the whole racket. There was a guarantee rate of 6d. in the pound which fell on them; and the whole idea when the concern passed into the hands of the Corporation was that, if they made a profit, it might be done by carrying a certain amount of the profit to the relief of the rates, or it might be done by a differential rate. If they had the power to charge the people outside Glasgow a differential rate, then there might be no reason for carrying any surplus profits to the relief of the rates. But they had not; they were within the City supply district. In forty years the Corporation of Glasgow had only carried £21,000 to the relief of the rates; but the Committee of the House of Commons had said that all the money was to be applied in the reduction of the price of gas. He must take the Bill, considering that it would be an advantage to the inhabitants of Glasgow; but there was a large number of people who said they were ratepayers in Glasgow, and if they could not get the profit in Glasgow then the Corporation might come down on them. There was a number of petitions against alterations, and others wanted the Bill as it left the House of Commons. The Glasgow House Owners Association did not object to the Bill when it was before the House of Commons. He thought the measure was open to serious criticism at the hands of the people of Mearns and Carmunnock, and people in the Company's area with regard to finance; but he must leave it to the Committee to say whether they were right or wrong.

Evidence was first given by,

Mr. *M. W. Montgomery*, Chairman of the Glasgow Gas Committee. He said the consumers numbered 260,000, the quantity of gas made annually 6000 million cubic feet, and the price charged 2s. per 1000 cubic feet for lighting and domestic purposes. There had been a less charge for gas for motive power. In the supplementary supply area, the price was 1s. per 1000 cubic feet extra. The area of supply was 98 square miles, and included several counties. The length of mains was over 1000 miles.

Tuesday, June 28.

When the hearing was resumed this morning, a question of procedure arose.

Mr. J. D. FITZGERALD, who represented various boroughs who were petitioning against alterations, said these were boroughs on whose petitions the Bill was altered in the other House. He objected to the *locus* of Mr. Vesey Knox, who appeared for the Glasgow House Owners Association and others.

Mr. VESEY KNOX said that if Counsel for the Bill objected to his *locus*, he was willing to deal with it.

Mr. FITZGERALD contended that the Glasgow ratepayers, as represented by Mr. Vesey Knox, were not entitled to be heard at all. If they had presented a petition against the original Bill, they would not have been entitled to be heard, because they would have been petitioning against their own Corporation. They now came before the Committee in the guise of opponents, to ask that the Bill, as originally brought into the other House, should be passed.

Lord ROBERT CECIL supported Mr. Fitzgerald in his contention.

The CHAIRMAN at this point called upon the promoters' Counsel to resume examination of

Mr. *Montgomery*, who said that, in relation to clause 26, dealing with the price of gas, the price was governed by certain sections in their existing Acts, among which was section 9 of their Gas Act of 1882. The result of the operation of this section was that there was to-day, firstly, a flat-rate to all consumers of gas supplied by meter; secondly, a lower flat-rate for gas supplied for trade purposes; a flat-rate, again, for public lamps; and there was at present a differentiation between gas for industrial purposes. The Corporation were allowed to supply non-illumination gas for other purposes. It was essential for trade uses to sell gas at a price lower than that at which it was supplied for lighting. As brought into the House of Commons, the Bill contained proposals which were set out in the petition now presented by Mr. Vesey Knox; and the Glasgow Corporation were desirous of obtaining, if they could, legislation upon these lines. But in the course of the hearing in the other House, the clause was altered to the form in which it now stood in the Bill. Under the clause there was a flat-rate for public lamps, and higher rates in the supplementary supply district to those charged in the City area. Nowadays, gas for industrial purposes had to compete with electric current; and it was becoming the common practice to enable gas companies to supply at a lower rate for certain purposes. In his view, it was fair and just that the Corporation should be entitled to charge an additional sum in respect of the outside area. The charges for distribution would be greater. In the supplementary district they were not liable to any rate or charge in case of deficiency; and they took no risk. The Railway Companies were asking that they should have the same charges in respect of the lighting of lamps along the canal as were given to local authorities; but these were the private property of the Companies, and he could not agree to their suggestion. The canal was within the City area.

Mr. LANKESTER, who appeared for the Railway Companies, said he would not press the point.

Mr. BLENNERHASSETT, on behalf of the Baillieston Gas Company, at this point asked the Committee to deal with clause 6 of the Bill, regarding the limits of supply.

This course being accepted by the Committee,

Mr. *Montgomery* also gave evidence upon this point. He said the Corporation had powers to supply in the Baillieston Gas Company's district; but they had not exercised these powers. Since 1862, the Baillieston Company had given a supply, and the Corporation had not intervened. But when this Bill was promoted, the Baillieston Company approached the Corporation; and an agreement was entered into that if the Baillieston Company's district was put in the supplementary area, the Corporation would purchase the undertaking for £10,000. The Committee of the Lower House, however, held that the district should be in the City supply area; and the agreement thus came to an end. As matters now stood, the Corporation were willing to exclude the district and not give a supply of gas. The Coatbridge Company also had powers to supply this particular district, but had never exercised them. It would be detrimental to the interests of the district if competition were allowed, and prevented the Baillieston Company from putting their undertaking in a satisfactory position.

Mr. CRAIG HENDERSON then examined witness on behalf of the proprietors of various estates in Mearns and Carmunnock. He said there was a small estate in the parish of Mearns within 2 miles of the Busby Gas-Works; but it would be unprofitable for that Company to give a supply. The Corporation gave a supply to the estate; the charge being 1s. per 1000 cubic feet above that in the Glasgow city area. In Carmunnock, there were two estates which were supplied by the Corporation under their powers of "places adjacent thereto." The Baillieston Company were prepared to supply on condition that they obtained something like what they asked for in the House of Commons.

In reply to Mr. BEVERIDGE, for the promoters, witness said the position of the Baillieston Company was in no way altered by the Bill, and there was no reason why they should be put in a different position to that which they had held for some fifty years. The Glasgow Corporation were quite prepared to supply certain parts of the parishes of Mearns and Carmunnock if required, to the extent of 130 acres in the former parish and 500 acres in the latter.

Mr. *Alex. Wilson*, Gas Engineer and Manager to the Glasgow Corporation, said their area of supply was not increased by this clause; and he denied that the limits were vague. The only really undefined area was in the parish of Cadder and in Baldernock.

In reply to Lord ROBERT CECIL, who appeared for the Lanark County Council, witness said the Corporation desired to define the supplementary area. They had power to charge a 50 per cent. higher rate in the supplementary area; and it might be more expensive for them to deal with areas such as Carmunnock. They were content to deliver gas on the boundary at 2s. per 1000 cubic feet; but it was thought that the supply of the suggested 500 acres in Carmunnock might not be a profitable business.

Mr. JOHN WILSON, for the Busby Gas Company, remarked that, in consequence of what Mr. Balfour Browne had said in opening the Bill, that the Corporation of Glasgow were desirous of continuing the supply to the people on the Netherton Estate and the estates in the parish of Carmunnock, the Busby Company recognized the reasonableness of allowing the continuance of that supply, and they thought this would have ended the matter. But it had since been indicated, to his surprise, that the Corporation were inclined to go back upon it, and desired not only to continue the supply, but to take up 500 acres in the parish of Carmunnock.

Mr. BEVERIDGE said the Corporation agreed to supply in Carmunnock on one side of an imaginary line which had been suggested, and in the parish of Mearns a triangular piece in which was contained the Netherton Estate.

Mr. *Sneddon*, the Chairman of the Baillieston Gas Company, then gave evidence on clause 6. He said that in 1857 the Glasgow Gas Company were authorized to supply Baillieston; and when, in 1862, a demand arose for a supply of gas, the Baillieston Company was formed, because the demand was not then sufficiently remunerative for the Glasgow Gaslight Company to give a supply. The original capital of the Baillieston Company was £1200; and it had now been increased to £4549. The price charged for gas was 3s. 1½d. When the tramway system was extended to Baillieston, the Glasgow Corporation extended their mains in order to serve the new buildings that sprang up. When the Corporation came for their Bill, his Company thought it a good opportunity to assert their position for fair treatment. If the Company were saved from the competition of the Corporation, they were content to go on in the ordinary way. But the Corporation retained the power to supply the Baillieston district; and with the fear of the competition hanging over their heads, they would be unwilling to undertake the necessary expenditure of putting the plant into a satisfactory condition. He did not see what right the Lanarkshire County Council had to interfere in the matter.

Replying to Mr. BEVERIDGE, witness said his Company had not obtained statutory powers. The area in question had been within the area of the Glasgow Corporation since 1869. He agreed that the Corporation had never endeavoured to compete with them.

Mr. BLENNERHASSETT, in addressing the Committee on the clause, agreed that in the legal position of the Baillieston Company there was no change. All they asked was that in the district they supplied the Corporation should not be allowed to supply. If the Corporation wished to purchase the Company's undertaking, they would be happy to meet them.

Mr. *Alex. Wilson* said that the Baillieston Company were content to supply as a non-statutory Company in a portion of the area of the Glasgow Corporation. But Glasgow did not see that it was to their interest to go into the district; and the Company might continue to supply in the future as in the past. He asked that the decision of the Committee of the Lower House should not be altered.

Mr. CRAIG HENDERSON said the Corporation had power to supply gas in the various burghs and "places adjacent thereto;" and it now appeared that they gave a supply to Netherton because they were hoping to gradually extend their mains further afield. But it would be unheard of to say that, because a gas authority went into one area to use that as a stepping-stone to get into further areas, and finding itself baulked by Parliament, it was thereupon to be entitled to say it was going back and would not supply the area at all. In the fight as to what should be supplied, the position of actual consumers in these areas was overlooked altogether, and they were left out. He asked that the Corporation, having applied for more than they were entitled to in the other House, and having been refused, should be compelled to continue their supply to the Netherton Estate. The Busby Company were prepared to say that a line might be drawn in the parish of Carmunnock, and it would relieve the question as to what was to be the price of gas in that area by putting it in the City supply district.

Mr. JOHN WILSON concurred entirely with this request.

Mr. BEVERIDGE announced later that, with regard to the opposition of the County Council, certain words had been agreed with the promoters. With regard to Baillieston, the Corporation would accept whatever the Committee saw fit to decide.

The CHAIRMAN announced that the Committee's decision on the clause would be given later on.

Clause 26 was then considered.

Mr. *Montgomery*, having given his evidence in chief on the clause, was examined by Mr. LEWIS COWARD, on behalf of the manufacturers, engineers, and other consumers of gas. Witness quite agreed that the petitioners represented a consumption of 250,500,000 cubic feet of gas, and the total valuation of the premises they occupied was about £160,000 a year. When the Bill was introduced into the Lower House, it contained a clause allowing the Corporation to charge a differential rate to large consumers. It was a good principle to encourage differential rates to large consumers. He could not see why the Bill should be an exception. The burghs of Govan and Partick had their own electricity undertakings, and gave large discounts to power and lighting consumers.

By Mr. LANKESTER: The Railway Companies ranked very high among the large gas consumers. He did not think that any injury would be done to the small consumers by this proposal. He thought it would benefit all consumers, as it enabled them to lower the price all round. There was no intention to allow discounts to large consumers in Glasgow that would not be allowed to large consumers in other districts.

When Mr. SZLUMPER rose to question witness on behalf of the Glasgow House Owners Association and others,

Lord ROBERT CECIL remarked that they ought not to be heard.

Mr. SZLUMPER contended that it was not for Lord Robert Cecil, as a petitioner, but for the promoters to object to his *locus*.

The Committee decided that it was for the promoters alone to object.

Mr. BEVERIDGE, representing the promoters, remarked that he did not object, because he thought they had most excellent *locus*. They were consumers of gas.

Mr. SZLUMPER then resumed his examination of witness, who said that the Bill as assented to by the ratepayers was a very different one from that which was now brought forward. With regard to the differential rate to large consumers, which was in the original Bill, he said they were now debarred from giving consideration of this kind, and it would react to some extent to the detriment of small consumers. There was no doubt that of late years competition with electric lighting had become very seriously felt; and if the Corporation could not give considerations of this kind to large consumers, there was the possibility that they would make their own gas or take electricity, because the electrical authorities had power to give very large concessions in this respect. They were not asking to give advantage to the consumers in Glasgow alone, but to all consumers alike on the basis of consumption. Under the present clause 26, they would be unable, however large a consumer might be, to give him the slightest concession.

In reply to Mr. JOHN WILSON, representing the Lanark County Council, witness said the petition was signed by the owners of property, or a factor for an owner. The factors represented those who paid for the gas.

Mr. WILSON: Supposing the Corporation had power to give a reduction in price to large consumers, the Corporation would get the most benefit, would it not?

Witness: I think not.

Supposing a large consumer paid £1000 a year for his gas, and you pay him £100 off under the power you desire, who would have to contribute this £100?—It would come from the increased earnings of the concern.

But it would be contributed to by the poor consumers?—By all the consumers.

In reply to further questions, witness said he did not agree that because the Corporation owned the electrical undertaking as well as the gas undertaking that whoever had the benefit it would come to the same thing. The Bill gave them power to differentiate between the City limits of supply and the supplementary area, and they were entitled to charge 50 per cent. more in the latter area, which was the maximum. In the City area, the maximum was 4s. 7d.; but they were only charging 2s., and in the supplementary area 3s. He did not know any company in Scotland with so high a charge in the outside area. Asked why they should want to charge 3s. in the Baillieston district, just over the line, and 2s. to consumers on the other side, witness said they must draw the line somewhere.

Replying to Mr. CLODE, who appeared for the boroughs of Partick, Govan, Rutherglen, and Carmunnock, witness agreed that these boroughs could not start gas undertakings at all; they could not compete with the Corporation. He would express no opinion now upon the differential rate; but he did uphold it before the House of Commons Committee, and was still of the same opinion. If the differential charge were allowed, it would be an advantage to the manufacturers of Govan, Partick, and other places, as well as to those in Glasgow. The total number of consumers was 259,727; and the large consumers numbered 821.

In answer to Mr. JOHN WILSON, witness said 50 per cent. was none too high a difference in the supplementary area; and if they had to supply a great distance outside, in some cases it would not be sufficient.

At this point, with the permission of the Committee,

Mr. *W. Doig Gibb*, the Chief Engineer of the South Metropolitan Gas Company, was called by Mr. LEWIS COWARD, in support of the petition of the manufacturers, engineers, and other consumers of gas. Having referred to his connection with the Newcastle and Gateshead Gas Company, witness said their output last year was 3350 million cubic feet, and their capital was about 2½ millions. The present price of gas ranged from 1s. 11d. to 1s. 7d. per 1000 cubic feet; the present gross price being 2s. 2d. They recognized the principle that large consumers should have a rebate; and their scale of discounts ranged up to 25 per cent. Newcastle was very similar to Glasgow, in that it depended largely upon the engineering trade; and it was necessary in an industrial town that large consumers of gas should have a discount unless the town was to be handicapped in competition. The large consumer of gas was very seriously handicapped if he did not get these discounts. The discounts reduced the price of gas to the small consumers as well as to the large ones. It had been the practice in Glasgow hitherto that they should be allowed; and their withdrawal would tend to lead to the scrapping of plant, and electricity being used instead of gas. The principle had been recognized by Parliament in numerous Acts; and there was a Model Clause on the subject. It was the same with electricity and water; and it was the case in all trades that the large consumer was allowed a discount. The only argument that might be used against a scale of discounts would be that it told hardly on the consumer; but so far from this being the case, his experience was that the small consumer was benefited. In Newcastle, the scale was 10 per cent. to small consumers, and an additional 15 per cent. to the larger ones. Nevertheless, the larger consumer was the more profitable to the Company. It followed that, with the small consumers, for every 1000 cubic feet distributed, the cost of distribution, leakage, the collection of small amounts, and so on, was very much greater than with the large consumers. These were elements which should be taken into consideration in fixing the price of gas to large consumers. Turning to the South Metropolitan Company, witness said that last year they manufactured 13,000 million cubic feet of gas; and the present gross price was 2s. 2d. per 1000 cubic feet. They had a scale of discounts which varied from month to month. This showed the elasticity required in these matters. The result of giving these discounts was that in 1909 it was recorded to him that 44 consumers, with an average consumption of 1¼ million cubic feet each, were retained as gas consumers. They were absolutely kept from

taking power gas by the large discounts the Company offered. Altogether, their department had traced, as the immediate result of the larger discounts, an increased consumption of gas during the year of 52¾ million cubic feet. It was the fact that, as the result of the larger consumption of gas due to the discounts, they were able to reduce the price all over the district to their consumers by 1d. per 1000 cubic feet, which represented, roughly, £52,000. "I consider," witness said, "that, both for the producer and the consumer, it is of the utmost importance that there should be a certain amount of elasticity allowed to gas companies in giving reductions to large consumers."

Mr. FITZGERALD: Is it not a reasonable thing that the profits made in a gas undertaking, after all charges have been met, should go to a reduction of the price of gas?

Witness: Yes.

It would not be fair to the gas consumer to increase the price of gas at the expense of the electric undertaking, or to reduce the price of electricity at the expense of the gas undertaking?—No.

Wednesday, June 29.

When the public were admitted to the Committee room this morning,

The CHAIRMAN announced that the Committee had been considering the question of area. With regard to the triangle in the parish of Mearns, they were of opinion that it ought to be included in the supplementary area. They considered also that Baillieston should be included in the supplementary area.

The Marquis of BRISTOL asked whether it was understood that in the City area there was a flat-rate for lighting and another flat-rate for power, and whether in the supplementary area, the Corporation might charge any sum up to 50 per cent. more than the City rate. It was not quite clear to the Committee whether in the supplementary area there was a flat-rate or whether the Corporation had the power, up to 50 per cent., of charging to any particular area what they liked.

Mr. BALFOUR BROWNE said he thought there was no flat-rate in the supplementary area. At the present time, although they were seeking to have a 50 per cent. maximum in the supplementary supply area, they did not mean to charge everybody alike in that area—it depended on circumstances. In a portion of Mearns, they had charged 3s.; while in Carmunnock the people laid their own pipes at great expense, and the Corporation had charged them 2s., although they were both in the supplementary supply area. The Corporation desired to have this power in future, even if the flat-rate should continue in the City of Glasgow. The Act provided that: "The Corporation may, within the supplementary supply district, or any part thereof, charge rates for gas higher than those charged within the City supply district, and such higher rates may vary in different parts of the supplementary supply district, but shall not at any time exceed the rates charged for any similar purpose within the City supply district by more than 50 per cent. of the rate charged for private lighting purposes within the City supply district, and shall not in any case exceed the said maximum price." Therefore they had power to vary the charge in the supplementary supply area.

The CHAIRMAN said that, with regard to Carmunnock, they thought that the portion of the parish above the imaginary line which had been referred to should be taken into the supplementary supply area.

Mr. BLENNERHASSETT said that, with regard to Baillieston, he supposed the decision of the Committee meant that the agreement between the Corporation and the Company should be carried out.

Mr. BALFOUR BROWNE: We cannot do that.

Mr. BLENNERHASSETT asked the Committee to say that, until the Baillieston Company were purchased by the Corporation, there should be no power on the part of the Corporation to supply gas in the Baillieston Company's area.

Mr. BALFOUR BROWNE: We are not going to purchase. It is a non-statutory Company.

The Committee decided that they could not agree with Mr. Blennerhassett's suggestion.

Mr. BALFOUR BROWNE pointed out that Baillieston was at present within the City supply area; so that the consumers were entitled to a supply at 2s. The decision of the Committee put them in the supplementary area; and the Corporation could now charge them 50 per cent. more.

Mr. BLENNERHASSETT said that if the other House had put Baillieston in the supplementary supply district the Corporation would have been bound to purchase their undertaking; and he asked that, now they had been put in, the Corporation should be called upon to purchase.

Mr. BALFOUR BROWNE pointed out that the agreement between the Corporation and the Baillieston Company was absolutely dead.

The CHAIRMAN said the Committee's decision was to include Baillieston in the supplementary area without any further provisions.

Mr. CRAIG HENDERSON, with regard to the parish of Carmunnock, pointed out that the line to be drawn across the parish had been agreed, and would be placed before the Committee later on.

Mr. *Alex. Wilson*, who gave his evidence in chief on the previous day, was then examined by Mr. LANKESTER, on behalf of the Railway Companies. He said it was the common practice of gas companies to allow discounts; and they found it to their advantage to do so. It was in the interests of lowering the price generally. He was in favour of a reduction in price to large consumers. It was in the interests of all the consumers. He could not understand why the manufacturers in the boroughs of Govan and Partick should be placed in any different position in regard to the competition they had to meet from other places. Asked if the Corporation were anxious to reduce the price of gas to the Railway Companies, witness said they wished to reduce the price to everybody. As the Manager of the Gas Department, he would like the Bill amended.

Replying to Lord ROBERT CECIL, witness said there was a modern case of a differential rate being allowed in Edinburgh, where the charge was 3s. 6d. and 3s.; but in the case of Glasgow, if they were not given the 50 per cent., it was possible that it would be unremunerative to them to give a supply.

Mr. *Corbet Woodall*, the Governor of the Gaslight and Coke Company, next gave evidence. He agreed that, under the circumstances, it was fair and reasonable that there should be an extra charge of 50 per cent. as a maximum. If there were many places where they might supply without great extra cost, there might be no reason for making an extra charge; but there were a great many undertakings where as much as 1s. per 1000 cubic feet extra was allowed in the outlying districts. There was a long list of cases where a differential rate had been given, and the amount of this differential rate would diminish as the years went on. In this case, the supplementary district was fairly treated.

Replying to Mr. LEWIS COWARD, witness agreed to a differential rate to large consumers.

In answer to Mr. LANKESTER, witness said it was not true, as had been suggested, that there was no power to give discounts in London. The matter had become more and more acute since the introduction of electric competition. Electrical corporations and companies were allowed to make special terms; and the difficulty of gas manufacturers was very great indeed when large manufacturers asked for a lower price and they were unable to give it. It was not unusual for railway companies to pay £4000 or £5000 to gas companies annually; and if they were lost to a gas company because they were unable to offer a lower price, it would be a very serious matter.

Replying to Mr. VESEY KNOX, witness said that, in accordance with the general law, gas companies could not merely differentiate between large and small consumers, but they could make any special bargains they liked. He knew of no other case where a gas undertaking had been placed under such restrictions that they were compelled to give a flat-rate. It was quite novel, and he did not know of any case where a gas undertaking had been compelled to give the same terms to all consumers, apart from the amount of their consumption.

Replying to Mr. FREEMAN, he agreed that by section 9 of the Glasgow Act of 1882 all consumers were to be treated on the same basis.

Mr. FREEMAN: You are going to charge on the small consumer what you lose on the big one?

Witness: We do not lose on the big consumer.

You are in favour of altering the law which has worked very well for a number of years past, and therefore the onus is on you to prove that it will not be a hardship?—It is only by supplying the large consumers that we are able to keep the small ones.

Continuing, witness denied that the outlying places would be injured in any way. There were precedents for what they were asking; but he agreed that they were of very old date. The tendency had not been to abolish differential rates. He did not agree that the practice of Parliament had been to say that gas companies were not to milk the outside district to the benefit of the inside area. There were certainly a great many places where no geographical differential rates had been allowed; but he would be very much surprised to hear that there were 200 cases in England without a differential rate, against 30 with. He agreed that in Scotland there were 53 cases without a differential rate, as against 8 with. With regard to Baillieston, he thought this area could be supplied by the Coatbridge Company. Their price for gas was 2s.; but he did not know whether they would be able to supply the district at the same rate.

Re-examined by Mr. BEVERIDGE, witness said it was the working charges that made the outside districts so costly. There were longer service pipes and many things to be considered. Fifty per cent. was a just amount to be allowed.

This closed the evidence on behalf of the Corporation upon clauses 26 and 27.

Mr. COWARD then addressed the Committee on behalf of the manufacturers, engineers, and other consumers in Glasgow and Govan. He said that with the provisions of the Bill as it was introduced in the other House, the manufacturers were quite content; and they hoped it would become law. Unfortunately, in the absence of any evidence from the large consumers of gas, it had emerged a mutilated Bill. It was most unreasonable that the differential rates allowed in respect of the gas supplied in other industrial communities should be denied to the manufacturers of Glasgow. When section 9 was inserted in the Glasgow Act of 1882, prohibiting differential rates, the gas industry was in a very different position to what it was now.

Mr. *David M'Ausland*, representing the Felix Tube Works, Glasgow, said they paid £1516 a year for gas for lighting purposes. They had also a supply of electricity from the Clyde Valley Company, by whom they were allowed a reduction according to the quantity consumed. Gas ought to be put on the same footing. Competition was very keen; and the Bill would put them in an unfair position.

Mr. VESEY KNOX, on behalf of the Glasgow House-Owners Association, said that every recent gas company had had to incorporate provisions which, by implication, empowered them to give discounts for large quantities. It was the general law, both in this country and in Scotland. The provision prohibiting a gas company from giving such a discount was an antiquated and altogether absurd restriction. If this very stringent provision were applied to this Bill, the effect would be that the Glasgow gas undertaking must one by one lose the large consumers. They would either make power gas or take electricity; and the consequence would be disastrous in the first instance to the small consumers, and in the second instance to the ratepayers. He did not think it would be possible for those who wished to keep the Bill in its present form to call evidence from anyone who had experience of managing gas undertakings who would say that the restriction in the Bill was reasonable.

Mr. *W. R. Herring*, the Chief Engineer to the Edinburgh and Leith Corporation gas undertaking, said they had been allowing discounts in Edinburgh of 2½ per cent. for between £50 and £100, and going up to 10 per cent. for £800 and upwards. These discounts were based on the total amount of any individual account. It was not the fact, as had been suggested, that, if they allowed a discount to a large consumer, the loss of revenue represented by the discount must be made good by the small consumer. There was a gain by giving discounts; and the large consumer cost less to supply.

Mr. *H. E. Jones* said the Railway Companies, who were large consumers, should certainly have discounts and every encouragement to use gas. By these means the price would be reduced to the smallest consumer. It was the universal practice of all gas companies; and they had a sliding-scale, by which, if they could cheapen the gas, they got larger dividends. It was the practice of his Company (the

Commercial) to give discounts up to 25 and 30 per cent. They kept the price down to the working man consumer with a view of developing the use of gas for fuel. There was a saving to the producer in supplying in bulk to the large consumer; and if they did not charge him less than the smaller consumer, they were being compelled to charge him more than they really ought to. He knew of no case except this where the general practice had been departed from. If he were in charge of the Bill he could not accept it, because it would hamper him and prevent him from seeing to the best interests of the shareholders and consumers. He would refuse the Bill. He believed it was the general law in Scotland that when a gas undertaking was in the hands of the local authority the profits must be applied in the reduction of the price of gas. He would not describe this rule as Socialistic. The price of 1s. 10d. per 1000 cubic feet which his Company charged was due to the fact that they gave discounts to all the large consumers.

Thursday, June 30.

Mr. LANKESTER addressed the Committee this morning on behalf of the Railway Companies, and contended that they, being among the largest consumers, should be encouraged to take as much gas as possible, whether for illumination or power purposes. They challenged the promoters of the Bill to produce a precedent which prevented anything like a discount or consideration being given in regard to the quantity of gas taken. What they asked was that the clause should be altered so as to provide that the price to be charged for gas consumed by meter should at all times be charged equally "under like circumstances" to all consumers in the City supply district. Upon clause 27, dealing with discounts, he asked the Committee to follow the practice of all modern undertakings and introduce the Model form, which provided for discount for prompt cash payments, and allows for discounts or rebates to large consumers not exceeding in any case 15 per cent. They wished the Glasgow undertaking to be put on a reasonably sound and commercial basis, not only in the interests of the producer, but in the interest of the consumer. All the trouble had arisen from the unfortunate fact that a clause had been drawn to protect the burgh of Govan and the outside areas from preferential treatment to Glasgow. It was this unfortunate clause which prohibited the giving of discounts. The only objectors to what they were asking, and who would rather that the Corporation's undertaking should not be carried on in the most modern way, were the burghs of Govan and Partick, who had electric lighting undertakings of their own, which they were anxious to push in preference to gas.

Lord ROBERT CECIL then addressed the Committee on behalf of the County Council of Lanark. What he was asking was a modification of the section of the Bill which gave the Corporation the right to charge within the supplementary supply district 50 per cent. more than the rate charged for lighting purposes within the City district. It was said that it was Glasgow's duty to its own constituents to make as much as they could out of the outside areas; but he contended that the outside areas should be protected, and have a supply given to them on reasonable and proper terms—20 per cent. would be an extreme figure. He referred to Chryston, in the parish of Cadder, where the Corporation had entered into an agreement to supply at 3s. per 1000 cubic feet.

Mr. *E. H. Stevenson* gave evidence. He said that it was a most unusual provision to make the additional price in a supplementary district a percentage upon the price charged inside. The percentage, of course, had varied with the price of gas inside; but the cost of supplying the gas outside the district would not vary. The capital charges would be the same, as also would the charges for repairs and maintenance. The chief fluctuation in the price of gas would depend upon the cost of coal—that was to say, the price in the supplementary area would be affected by a general rise in the price of coal more than anything else. The general way was to fix a definite amount which might be charged in relation to the sum charged inside; and this should be, as nearly as possible, the extra cost of supplying the district. There were several precedents. In Birmingham, when the Corporation took over the gas undertaking, there was a difference of 1s. per 1000 cubic feet on the differential rate; and in 1878, the outside districts brought a Bill in Parliament to do away with the differential price, and Parliament passed the Bill. At present, in Birmingham there was a differential rate over the whole area. In the case of Salford, the differential rate was done away with in the outside districts. In Manchester, there was an outside district; but it was not a wide one, because there were so many gas undertakings in the immediate neighbourhood. Manchester charged 2s. 3d. in the city, and 3d. extra outside. In Leeds, there was a flat-rate; in Oldham and district, there was no additional charge outside; and in Nottingham, there was a flat-rate—in that case, there was a large outside area.

Mr. VESEY KNOX: But there are discounts allowed?

Witness agreed. But so far as he knew, there was no example in England of so large a differential rate as 50 per cent. He thought it was a wrong principle to put a percentage into a Bill. Assuming there was to be a differential rate, he would limit the price by ascertaining what would be the additional cost; and in this case, he did not think anybody could prove more than 6d. per 1000 cubic feet as the outside maximum. He thought it was the general rule either to have a low price fixed by Act or a single price fixed as a maximum. In Scotland, including Edinburgh and Glasgow, there were only eight corporations who were charging a differential territorial rate. In the conditions of the Glasgow undertaking, he could not see anything to make it reasonable that they should be allowed to charge in Baillieston 1s. over the lighting charge made in the City. Glasgow had all the favourable conditions for the cheap manufacture of gas. Carmunnock, Baillieston, and Cadder were all within such distances that they could be easily and inexpensively supplied. It was not a widely-extended area; and the cost of mains would be very small.

Mr. BALFOUR BROWNE: If we have ascertained that 1s. in addition to the 2s. will not pay, then we are entitled to charge 1s. extra?

Witness: There is no question of doubt in my mind that any part of these three additional places can be supplied at less than 1s. extra. Continuing, witness said that in Baillieston all that would have to be done would be to extend the existing mains which were within 200 yards of the boundary.

Mr. FITZGERALD, on behalf of the burghs of Partick, Govan, Rutherglen, and Pollokshaws, said that it was especially for the protection of the gas consumers of the outside burghs that they got from Parliament a statutory prohibition preventing the City of Glasgow from charging higher rates outside the City than they were charging inside. This principle was adopted in 1882. When the present Bill came to be considered in the House of Commons, the position in Glasgow was that they were bound to charge for private lighting the same price to everyone; and they were, in fact, charging for trade supplies a lower price. As originally introduced, the effect of the Bill on the outside districts would have been most serious, and, accordingly, for the purpose of preserving the *status quo*, the decision given in 1882 should be preserved; and in future every person within the City supply district should be entitled to get gas at the same price for lighting, and every local authority should be entitled to gas for public lighting at the same price. With regard to trade supply, all they asked was that the rate charged should be the same to all consumers.

Mr. BALFOUR BROWNE, on behalf of the promoters, said they were content with the Bill as it passed the House of Commons; and it was for the Committee to judge between the two sets of opponents where the truth lay. He would be perfectly neutral, but asked that part 5 of clause 26 might be retained, giving the Corporation power to charge the 50 per cent.

The CHAIRMAN, after a deliberation in private, announced the decision of the Committee on clause 26. The effect of the decision was that the price to be charged for gas consumed by meter shall at all times be charged equally *under like circumstances* to all consumers within the City supply district. The Corporation may supply gas for heating, cooking, or motive power, warming, ventilating, and for the particular requirements of any trade, &c., provided that the rate charged for the gas supplied shall be the same *under like circumstances* to all persons. Sub-section 4 of the clause, relating to the price to be charged for public lamps, and sub-section 5, relating to the price to be charged in the supplementary supply district, were passed without any amendment. Clause 27, giving power to the Corporation to allow discounts of 5 per cent. to consumers in consideration of prompt payment, was struck out, and the following clause, from the Model Bill, inserted:

> The Corporation may, if they think fit, allow discounts or rebates to consumers of gas in consideration of prompt payment of gas charges, not exceeding in any case 10 per cent. per annum, and, in addition thereto, or irrespective thereof, they may, if they think fit, allow discounts or rebates to large consumers not exceeding in any case 15 per cent.: Provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers: Provided, also, that notice to the effect of this enactment shall be endorsed on every demand note for gas charges.

Consideration was then given to clause 50, with regard to the application of revenue.

Mr. *Walter Nelson*, the Chairman of the Gas Committee, gave evidence. He said the clause was struck out in the other House; but the views he gave when the Bill was before the Commons Committee in its favour, he still held. The important part of the clause was that which empowered the Corporation to carry any balance from the undertaking to the credit of the Corporation for their general purposes. The Corporation wished to retain this power. Altogether, they had allocated £21,000 to public purposes. Their present indebtedness on the gas account was about half the capital which was put into the undertaking.

Replying to Mr. FREEMAN, witness agreed that the raising of the price of gas by 1d. per 1000 cubic feet would bring in £25,000.

Friday, July 1.

Mr. VESEY KNOX, on behalf of the House Owners' Association, was this morning permitted to call, in support of their petition,

Mr. *Corbet Woodall*, who said he attended before the Committee under an Order of the House. It was his opinion that a reserve fund should be established to meet extraordinary claims and demands. As an instance, he said that in this particular case the gasholders were blown up, and the undertaking suffered a loss of £44,000. It was also desirable to avoid fluctuations in the price of gas as far as possible. In the case of gas companies, any alteration in the price would mean an alteration in the dividend in the majority of instances; and this was undesirable from the shareholders' point of view. With regard to undertakings such as this, if the price went up there was almost inevitably a check on the rate of increase in the undertaking. People were discontented, and asked for other sources of supply. A regular price and a regular dividend were of very great importance to gas undertakings. The accumulation of the reserve fund was a matter involving a comparatively small sum which was not felt by the consumer; but the raising of the price of gas, even by 1d., was a serious thing. There was a sum allowed for depreciation under the clause; but this was not available for the purposes of reserve. In the other House, he calculated that the allowance for depreciation, when added to the cost of repairs, was 7d. per 1000 cubic feet. In the case of the Tottenham Company, it was 10d.; and with the Gaslight and Coke Company, it was 8d. In regard to the establishment of a reserve fund, and having in addition a sum available for the "Common Good" not to exceed 1 per cent. per annum on the amount of the outstanding capital charges, not to be paid in any year in which the price to ordinary consumers exceeds 2s., his opinion was that where the municipality was supplied at an even rate over a large area, part of which was within its own area and part not, they ought to have either a differential rate or power to take a certain amount of profits in aid of the rates. If a differential rate was charged as against the outside burghs, then he had no sympathy with the idea of making further profit. The consumers within the area would be sufficiently benefited by a differential rate, and would not need the protection of a sum taken in aid of the rates. In the Salford case, 1 per cent. was allowed for what was called "brains and risk;" and he thought this a fair limitation. It would be a great injustice if the loss of one year had to be made good and the profits of another year could not be applied to make that loss good. In the case of Glasgow, the gas supplied was of an illuminating power of over 19 candles; and under these circumstances, he did not know of an instance where a lower rate than 1s. 10½d.

had been charged. If the outside consumers were assured that no profit should be put to the "Common Good" unless the present low price was maintained, there would be no injustice to the outside consumer.

In reply to Mr. J. D. FITZGERALD, witness said he did not at all represent that he was appearing there as an unwilling witness.

Mr. FITZGERALD: You could not come without the leave of the Corporation of Glasgow, because you have been already retained to give evidence for them?

Witness: You may put any interpretation you like on it.

Of course, a witness cannot appear for a Bill and against it, and that was your position?—I think the Committee have already found there is a mixture somewhat between the promoters and the opponents here. I may say that I should not have been here this morning had not it been for the Order of the House.

I hope you do not think I am making any personal imputation upon you at all?—Not at all.

Replying to further questions by Mr. FITZGERALD, witness agreed that the burghs of Govan and Partick were quite capable themselves of supporting profitable gas-works, and from these burghs there must be a considerable profit made on the supply. These places had the advantage of the capital raised by Glasgow, they had the advantage of the management of the Glasgow Corporation, and they had the security from any loss resulting from accident or what not. In Glasgow, the maximum price was 4s. 7d., and the present actual price 2s.; and it was almost inconceivable that they would want to go beyond the maximum price. It was sometimes the case that if any unusual demand came upon a gas undertaking it had to be met out of revenue; and if the revenue of the year was not sufficient, it was carried to a suspense account. In the same way, if there was a deficit in one year, it was usually met out of the profits of the next year.

In answer to Lord ROBERT CECIL, witness agreed that the reserve fund was to be a very considerable sum—£20,000 per annum. This was not quite equal to 1d. per 1000 cubic feet on the price of gas.

Mr. VESEY KNOX said he intended to place before the Committee a clause with regard to the reserve fund; and he proposed that it should be the same as in the Salford case—½ per cent. per annum, and a maximum of 10 per cent. on the outstanding capital. In round figures it would be £11,000 a year, and a maximum of £220,000.

Mr. *Nelson* then resumed his evidence. Replying to Lord ROBERT CECIL, witness said that where they were trading in an area outside the City boundaries, he thought it right to tax the consumer of gas and place the profits to the relief of the rates. He would tax those outside for the benefit of those inside; and the more profit that could be made out of them the better. But there were limitations.

Mr. *Thomas Stuart*, a solicitor, then gave evidence on behalf of the House Owners' Association. He said that there was a gas guarantee rate of 6d. in the pound, which might be levied in the event of any deficiency in the payment of the gas annuities. There was a liability on the owners and occupiers of a capital debt exceeding £2,000,000, for which the entire obligation was upon the City of Glasgow itself—it was not shared by the outside areas. He agreed that the best way to keep the charge for gas down was to devote the profits of the gas undertaking to the reduction of the price of gas. If there was a loss on the gas undertaking it was not always advisable to raise the price of gas in order to meet it. There was a strong feeling that the borrowing powers asked for by gas authorities should absolutely prohibit the pernicious practice of selling dear gas to relieve the rates; but he disagreed that establishing a reserve fund would make the gas dear.

Mr. *H. E. Jones* said the reserve fund was only spreading over a number of years, in the shape of a small composition of ½ per cent. per annum, a sum which would equalize the price of gas over a long period; and whether they charged a higher price in some year after making a loss (which meant a large contribution from the gas consumers), or whether they took a small contribution from him for a number of years until there was 10 per cent. accumulated and then took nothing more from him, was really a matter of indifference, except that the reserve fund made the undertakers more safe in surviving fluctuations of the coal market and such like things. The Glasgow Corporation had not a reserve fund; but they had power to carry any surplus to the "Common Good," and they had been singularly self-denying in exercising it. A corporation trading outside its own limits might be regarded as a company taking a risk and carrying on a trade for the benefit of outsiders. In this case, the outer areas would have to depend, and did depend, on very expensive supplies of gas, and very small gas undertakings which could not possibly manufacture cheaply. This was a consideration which not only justified an extra price of gas in these cases, but even in the cases within the Metropolitan limits; so that the consumer got the advantage in his neighbourhood of a large and a very successful gas undertaking. He did not think these people ought to expect the ratepayers in Glasgow proper to take any risk on their shoulders in respect of what might happen in the case of some great invention superseding gas altogether. In the Salford case, Lord Donoughmore, the Chairman of the Committee, laid down lines which he (witness) was bound to admit the Salford Corporation would not accept; but to his mind, they were fairly clear and reasonable conditions to lay down. Lord Donoughmore made provision not only for the reserve fund, but for what he called brains and risk. But he clearly did not mean so much brains as risk, because he limited it to 1 per cent. upon whatever the capital outstanding on the undertaking might be; and clearly, with an undertaking that was redeeming its capital, this balance diminished while the concern probably grew and extended, so that his measurement of the brains could not have been in proportion to the scale of the undertaking. He must have had in his mind the risk, because he remitted it to the diminished amount of the outstanding capital; and that seemed reasonable. Witness considered it fair, in the circumstances of Glasgow, that this should be allowed, inasmuch as they had power to carry sums to the "Common Good." This was part of the statutory bargain between the owners and the ratepayers of Glasgow and all others concerned at the time that the undertakings were purchased from the Companies. This power had not in any respect been abused; and the only amount now standing to the credit of the gas undertaking in this respect was about £21,000 over a period of forty years. He distinctly disapproved of the large sums carried to the rates in many cases. There was no reason why Glasgow should be deprived entirely of the powers they had had without abusing them for 41 years; and they ought to have a sum which would go towards diminishing the risk to the house owners in case of some sudden invention which might convert the whole thing into a total loss.

Mr. FITZGERALD: I am sure you do not want to retract in any way what you told the Committee the day before yesterday?

Witness: No; not in the least. But you then put it to me that all the profits should go in the reduction of the price of gas. My answer was intended to mean that profits should go in the direction of a reduction in the price of gas—that is to say, that they should mainly go in the reduction of the price.

Mr. VESEY KNOX then addressed the Committee on behalf of the House Owners' Association. He said that when the Corporation took over the gas supply on terms set forth in their Act of 1869, one of the terms was that a surplus might be carried to the general purposes of the Corporation, and he now asked that a reserve fund be established. He asked the Committee to accept the following additions to clause 50, with regard to the application of revenue.

Eighthly: In providing, if the Corporation think fit, a reserve fund, by setting apart a yearly sum not exceeding ten shillings per cent. upon so much as is outstanding for the time being of the moneys borrowed or re-borrowed for the purpose of such undertaking, and investing the same, and the resulting income thereof, in statutory securities, and accumulating the same at compound interest until such fund amounts to a sum equal to ten per cent. of the moneys so outstanding, and whenever the said fund amounts to that sum the income therefrom shall be applied in the same manner as moneys received by the Corporation by way of revenue in respect of the said undertaking: Provided that if and whenever the said reserve fund shall fall below the said last-mentioned sum the Corporation may set apart such yearly sum as aforesaid until the said reserve fund shall amount to such last-mentioned sum.

Ninthly: In any year when the price charged to ordinary consumers within the City supply district does not exceed 2s. per 1000 cubic feet of gas, in setting apart a yearly sum not exceeding one pound per cent. upon the amount of moneys borrowed or re-borrowed in respect of the undertaking, and for the time being outstanding, and upon the amount of the estimated capitalized value of the annuities as on the 31st day of May, 1909, after deducting all sums repaid and all sums outstanding to the credit of the sinking fund, which sum shall be carried to the credit of the Corporation for their general purposes.

Counsel went on to say that 1 per cent. would amount to £22,000 a year. This was a very modest profit for the people who had found the whole of the capital and had run all the risk. If the Committee followed the decision given in the Salford case, justice would be done to the ratepayers.

Lord ROBERT CECIL said that the application of the profits of the undertaking in the past had been in payment of capital charges. This had been contributed to by all, and had been to the benefit of Glasgow, because it was a repayment of the loan they had raised. The outside districts were all quite ready to share in the remote possibility of raising a guarantee fund. They did not desire to resist the Corporation in creating a reserve fund if it were thought a desirable course. He asked the Committee to give the Corporation the reserve fund, but not the right to apply any profits to the relief of the rates. If the Committee thought the Corporation ought to have the right to apply profits to the relief of the rates, however, he asked that it should be made conditional upon their charging no more than 2s. per 1000 cubic feet all through their area.

Mr. *Hauston*, the Town Clerk of Govan, giving evidence in support of this position, said the burgh were absolutely tied to the Corporation for their supply of gas; and the profits from the undertaking ought to go to the benefit of the consumers. With regard to the House Owners' Association, he said the guarantee rate was levied on the occupiers, and did not fall on the owners at all. Moreover, he did not think there was any chance of this rate being called for. If the burghs were allowed to set up gas-works of their own, they could supply themselves as cheaply as they got it from Glasgow.

Mr. FITZGERALD said the question of principle really was, where they had a gas undertaking vested in a municipal body, an undertaking by which not only the constituents were supplied but large districts were supplied who were not constituents, whether the proper application of the fund resulting as profits from carrying on the undertaking was the reduction of the rates of the inside district or the reduction of the price of gas to the consumers throughout the district. If the second method were adopted, the result was that the profit made from all the consumers of gas was returned to all the consumers equally by means of a reduction in the price of gas. If, on the other hand, it were applied in the relief of the rates of the central town, it was applied only in relief of the ratepayers of that town, many of whom were not consumers of gas, and did not contribute to the profit at all. The great majority of English towns had the right to apply profits in relief of their own rates. The power had been considerably abused, and, in consequence, there was a strong tendency to do away with the practice. But in Scotland, since the year 1856, it had been the rule to apply the profits in the reduction of the price of gas. In this case, of the £22,000, something over £5000 a year would be paid by the outside burghs, which would be most inequitable.

The Committee, after a brief deliberation in private, decided that provision should be made for the creation of a reserve fund; but that there should be no relief of the rates by the profits from the gas undertaking.

Mr. BALFOUR BROWNE said he understood that in Mr. Vesey Knox's clause "Eighthly" would stand, and "Ninthly" would be struck out.

This was agreed.

The clauses were finally adjusted yesterday (Monday).

Prepayment Gas-Meter Charges at Bolton.—The *agenda* for to-morrow's meeting of the Bolton Town Council includes the following special motion standing in the name of Mr. France: "That it be an instruction from this Council to the Gas and Lighting Committee that the charge for gas supplied through the prepayment meters be fixed at the rate of 1d. per 30 cubic feet, instead of 1d. per 25 cubic feet as at present; and that such reduced charge take effect as from the 30th day of September next."

BRIGHTON AND HOVE GAS BILL.

PUBLIC LIGHTING QUESTION.

House of Lords Committee.—Monday, June 27.

(*Before the Duke of* BEDFORD, *Chairman, the Marquis of* BRISTOL, *the Earl of* WESTMORELAND, *Lord* BASING, *and Lord* DIGBY.)

The consideration of the clauses of this Bill (the opening proceedings in which appeared in the "JOURNAL" last week, p. 967) was resumed to-day.

Mr. BROWN (representing Messrs. Dyson and Co., Parliamentary Agents), on behalf of the County Councils of East and West Sussex, stated that the remaining points in the Bill to which they took objection were such as not to justify their further occupying the Committee's time.

Mr. TALBOT (representing the Brighton Corporation), remarked that there were two clauses to which they took exception; but on one of these they had practically arrived at a settlement with the Gas Company. On the other, which dealt with the terms under which the Company were to provide gas for public lighting, he said the substitution of the incandescent mantle for the old form of gas-burner had relieved the Corporation of the necessity which they were under, under the existing law, either of burning more gas than they wanted or of paying for more than they burned. They were asking now to be obliged only to take and pay for the gas which was actually wanted for the street-lamps. Section 31 of the Act of 1866 provided that the Company were to supply not less than 5 cubic feet of gas per lamp per hour, and in the Act of 1873, instead of the provisions in the Act of 1866 it was provided that it should be 5 cubic feet per lamp per hour; and there was a provision of 15,000 feet for each lamp each year, which worked out at about 4 feet per lamp. These provisions were with reference to the then type of burner—the old flat-flame burner. In 1908, the Corporation and the Company came to an agreement—the Company meeting them most fairly and properly; and they agreed to convert the 576 street burners into incandescent burners. The Borough Surveyor reported to the Corporation that, by the substitution of 3-feet burners for 4-feet burners, there would be a considerable saving. When approached on the matter, the Company pointed out that they had just made a conversion, and had based their estimate upon a contract of seven years; so the Corporation agreed that nothing should be done during the existence of the contract. They asked to be allowed to take 3 feet per lamp instead of 4 feet.

Mr. *Hugo Talbot*, the Town Clerk of Brighton, said the proposal would have the effect of repealing certain parts of the Company's Acts of 1866 and 1873 in regard to street lighting, the latter of which prescribed a minimum of 15,000 cubic feet per lamp to be taken in each year. If they took this quantity, it worked out at 4 feet per lamp per hour. In 1891, the Corporation established an electric lighting undertaking; and the bulk of the streets were now lighted with electricity. The use of 4 feet of gas in an incandescent burner gave an undue amount of light; and they were advised that a 3-feet burner would give 75-candle power, which would be sufficient for the purpose of their ordinary streets, and would give a better light than any of the electric incandescent lamps. They were seeking to preserve the contract between the Corporation and the Company until 1915.

In reply to Mr. BALFOUR BROWNE, who appeared for the Company, witness said that if their clause was accepted it would remove a contract which had been sanctioned by Parliament; but there was now a difference in the burner. The Corporation were the manufacturers and sellers of electricity. All the principal streets were lighted by electricity. It was competent for the Corporation, at the end of this agreement with the Company, to give up the use of gas altogether. Replying further to Counsel, who asked: "Supposing 4 feet per hour is just sufficient to give a really good light, why should it be reduced," witness said that at the present moment it was the Sanitary Authority, under the Public Health Act, who had the duty of providing street lighting; and they were the proper judges of what light was sufficient or not. He could not agree that 3-feet burners would give a bad light. Such light ought to be given as the Local Authority considered to be a good one; and so far as his observation went, the 75-candle power which was obtained from the 3-feet burner was a far brighter light, and compared most favourably with ordinary incandescent electric lamps.

Mr. TALBOT: At the end of this period of seven years, you are at liberty to discontinue the taking of gas altogether?

Witness: Yes; but we do not want to do that if we can help it. We shall continue it if we can do so on a business-like footing; but we do not want to burn more gas than we require, or pay for more than we burn.

Mr. RAM, on behalf of the Corporation of Hove, remarked that their position was almost identical with that of Brighton. But at Hove there was no agreement with regard to public lighting such as there was in Brighton.

Mr. *A. M. Paddon*, the Chairman of the Company, gave evidence. He stated that Hove took as much or as little gas as they wanted, and it had no effect on them at all. With regard to Brighton, he said the electric competition was one of the keenest in the kingdom.

Mr. BALFOUR BROWNE: In order to compete with the electricity, even by means of incandescent mantles, you want to give a really good and effective light?

Witness: We do, and we have done so. The Corporation have taken all the more favourable public lighting for themselves, and have left us with the less profitable portion.

Would 3 feet an hour give an effective and efficient light?—It would not. It would seriously impair us in the contest we are carrying on with the electric light.

Replying to Mr. TALBOT, witness said the Corporation were at present pledged to burn 4 feet; but that was by agreement, and wholly to the advantage of the Corporation. It was no hardship on them to burn 4 feet. He was not willing that the question as between 4 feet and 3 feet should be submitted to arbitration.

Mr. BALFOUR BROWNE (to witness): In Hove they are using just about 4 feet per hour?

Witness: Yes; because that is the amount necessary to give a good light.

Mr. *Joseph Cash*, the General Manager of the Company, said they wanted to give a better light than the incandescent electric lamps; and if they burnt less than 4 feet of gas per hour in a public lamp, they would have a half-filled mantle. It would be a dismal failure. The Company wanted to have sufficient gas burnt to give a good light, and one that would compete with electricity, in order that gas could hold its own.

In reply to Mr. TALBOT, witness said that, with the old fishtail burner, they got 2 candles per cubic foot—about 10-candle power. They could now get 60-candle power with a 3-feet burner. The illuminating power of the electric lights was about 25 candles. The Corporation were trying to drive the Company to the 3 feet; so that they could compare their electric light more favourably with gas.

Mr. BALFOUR BROWNE, in addressing the Committee on the point, remarked that in Hove, where they were absolutely free to burn as much gas as they pleased, they used 4 cubic feet an hour, because they thought it necessary to have a really good light. The Brighton Corporation were asking for the 3-feet burner, because they had the electricity supply in their own hands; and if the light they proposed were given, it would be a dismal failure in the Company's lamps, and the people would say they would not have gas, but electricity.

The Committee declined to amend the clause in the Bill.

The Chairman of the Company having formally proved the preamble, and the clauses having been adjusted, the Bill was ordered to be reported.

LONDON COUNTY COUNCIL (GENERAL POWERS) BILL.

Gas Companies and the Smoke Nuisance.

The Local Legislation Committee of the House of Commons, presided over by Sir FRANCIS LAYLAND-BARRATT, concluded their consideration last week of Part IV. of the above Bill.

The CHAIRMAN intimated that, with regard to the amendment of the meaning of the word "chimney," there were only two cases, so far as he understood, which it would directly affect. One was the railway companies steaming-up engines, and the other the gas companies discharging their retorts. The Committee, he said, had had no evidence brought before them by the promoters as to the existence of the nuisance, and it was very difficult for the Committee to give the extension of power in the absence of such evidence.

Mr. FITZGERALD remarked that, following the expression of opinion given by the Committee, they did not now ask to have included in the Bill any definition of the word "chimney." The only point for discussion was in regard to the elimination of the word "black;" so that in the future what would have to be determined by the magistrate would be simply whether a nuisance had or had not been created by the emission of smoke from a chimney. What the petitioners were really complaining of was that the emission of black smoke should be treated as a nuisance at all, forgetting the fact that it had been the law for fifty years. It was because the sanitary authorities had enforced this law that the petitioners were setting up a grievance. A loophole of escape had been found which had prevented the law from being effective in one case, and which certainly would prevent its being effective in other cases; and the petitioners against the Bill asked that the loophole should be left open, so that they might escape through it.

The CHAIRMAN: Then we may take it that the County Council are absolutely opposed to the suggestion made by Mr. Balfour Browne?

Mr. FITZGERALD replied in the affirmative. Continuing, he said that for the last forty years or longer gas companies had been placed by Parliament in the position that they were not excused under any circumstances at all if they created a nuisance. It was not a question of doing their best or not being negligent, or using the best appliances, or anything of that sort. It was found that the South Metropolitan Gas Company had never during the last forty years been proceeeded against at all, or been the subject of complaint. In regard to the Gaslight and Coke Company, they had not been proceeded against for a number of years. Of course, there was a time when the Company did not enjoy so high a reputation as it did at present. Rather than have the law weakened, the County Council would sooner have the clause struck out altogether. There was the alternative way of substituting the word "dense" for the word "black"; but the much simpler method of dealing with the matter was to strike out the word "black" altogether. If the word "dense" were inserted, they got rid of the question of colour. But the smoke had to be dense and create a nuisance; and if these two conditions were satisfied, the person emitting the smoke would be convicted. He agreed that by striking out "black," and inserting "dense," the Committee would be strengthening and not weakening the law, because they would get rid of the difficulty created by the Lots Road decision, and by the terms of the Act of 1891. Something had been said by opponents of the Bill about the nuisance created by the chimneys of private houses; but he did not see what bearing it had upon the question at all. Parliament had enacted in all the Acts that these provisions were not to apply to smoke coming from chimneys of private houses. All the local authorities in London were in agreement that the word "black" should be omitted.

The Committee considered their decision in private; and when the parties were again called in,

The CHAIRMAN said that they had given the proposal a considerable amount of attention, and they noted particularly, in the course of Mr. Fitzgerald's speech, that the County Council repudiated the suggestion of a clause on the lines which were proposed by Mr. Balfour Browne. He was not talking of the terms of the words; but the Committee had given the matter the most careful consideration, and had come to the conclusion that they had had no evidence before them which would justify them in assenting to the omission of the word "black" from the clause. It would have been of very considerable assistance to the Committee if some evidence had been produced as to the effect on the working of the omission of the word "black" in Scotland. The unanimous decision of the Committee was that the word "black" be not omitted; and therefore clause 20 would be struck out of the Bill.

WATER SUPPLIES PROTECTION BILL.

The Joint Committee of the House of Lords and the House of Commons who have been charged with the consideration of the above Bill (see Vol. CX., p. 879) met again on Thursday, the 16th ult.—Lord MACDONNELL presiding. When the proceedings were resumed,

Dr. HENRY N. DICKSON was examined. As regarded the provisions of the Bill, his view was that, as the law at present stood, it was not adapted to modern natural conditions, which were now so modified by artificial conditions as to cause serious injury. Suppose a large town required a considerable quantity of water, and that the supply had to be obtained without going to a distance, it must then be had from an artesian basin which caused injury in two ways. If water circulated easily within the basin, the basin as a whole became depleted through the extraction from underground exceeding the supply to the basin from the surface. Under these conditions, the injury was probably not apparent near the point or points of abstraction so much as in the more distant parts of the collecting area, because the water flowed towards the wells almost as fast as it was pumped. The second instance was that if water did not circulate freely the level of the underground water was lowered, temporarily or permanently, near the point of abstraction, and little or no effect was produced at a distance. With regard to the first case, the example best known to him was that of the effect of extensive pumping by the Metropolitan Water Board (and their predecessors, the New River Company and the East London Water Company) in the valley of the River Lee before Hereford, on the area lying to the north of Hertfordshire. From examination of the water conditions of Hertfordshire, and comparison with those in surrounding counties in which circumstances were similar, he had ascertained that in parts of Hertfordshire the flow of the rivers and springs were clearly affected by something abnormal and outside natural seasonal variations.

Lord DESBOROUGH asked witness's opinion as to the expression "protected area" in the Bill.

Dr. DICKSON replied that it meant an area within a radius of two-and-a-half miles from the works. It seemed to him a reasonable one, on the ground that the influence of a large extraction of water from a central point in a water-bearing formation of this kind was two-fold—a local "cone of depression" was formed, and the gradients determining the flow of underground water in the vicinity of the well were altered in directness and steepness. The formation of the local cone of depression was universally admitted. The disturbance due to alteration of gradients arose primarily from the influence of the local cone; and damage done by one well or supply to another in either case could be described as the result of "mutual interference." In witness's opinion, the passing of the Bill would be advantageous to those who could not afford to fight Water Bills before Parliamentary Committees.

Mr. THOMAS HANNELL was the next witness. He gave evidence to the effect that long years of experience had convinced him that the water supplies of the inhabitants of areas which were suitable, and which were now largely and every-day more and more called upon to supply water, were not sufficiently protected. Pumping from wells in the porous strata of these districts injured the private supplies; and under the existing law, no compensation could be obtained for such injuries. He supported the plea for the general necessity for protection being afforded, giving as instances his experiences in regard to wells that had been pumped dry, but which became serviceable after pumping had been discontinued for some time.

The CHAIRMAN said that the Committee were satisfied with the evidence on the points to which it related up to the present. They had not, of course, made up their minds; but he suggested that the points already discussed had been sufficiently dealt with by evidence.

Mr. G. J. GRIFFITHS, the Engineer to the Thames Conservancy, gave the result of his experiences in connection with the work of the Conservancy. The water of the Thames was considerably affected by pumping operations in the neighbourhood. This was proved when new locks were being put in place.

Replying to Lord DESBOROUGH, Mr. Griffiths said it was most important to the Thames Conservancy to protect the river by protecting its neighbourhood. If pumping was allowed without restraint, it would very seriously affect the interests of the Thames Conservancy.

The CHAIRMAN: As I understand your evidence, in order to enable the Conservancy to efficiently perform their duties, it is necessary that they should have full means to estimate the effect of any wells sunk in the neighbourhood of the Thames?

Mr. GRIFFITHS: That is so. We have not that power now; but the present Bill would give us the necessary authority.

At this point,

The CHAIRMAN said the Committee did not desire to take further evidence in regard to the affirmative proposition—that the Bill should be reported to the House. They desired to hear evidence against the measure. He understood there were several interests in question.

Some of the Parliamentary Agents present asked for time for consultation before calling evidence; and the Chairman acceded to this.

When the proceedings were resumed on the 21st ult.,

Mr. ALFRED BLACKBURN, the Resident Engineer and Manager of the Sunderland and South Shields Water-Works, stated that the effect of clause 3 would be to prevent the construction of new works and the extension of existing authorized works without further parliamentary sanction. This clause should not apply to any land already authorized by Parliament for the purposes of new works. All that could reasonably be required in future applications was a statement as to the land proposed to be acquired, and the purposes for which it was wanted. Undertakers should not be required to give details as to their works. Clause 3 would operate oppressively, because, under it, if suppliers wished (say) to deepen a well, make a borehole, or lengthen a drift, they would have to apply to Parliament for authority. If any great development of an original project, amounting practically to the construction of new works, were contemplated, there would be much to be said for a proposal that an application to Parliament should be necessary; but a general measure, such as the one now before the Committee, should not apply to existing undertakings. Where it could be proved that lowering of the water level had produced actual damage, and that it was due to the operations of the water authority, the principle of compensation should be admitted. The shifting of the burden of proof proposed by the Bill would not be fair. There was great difficulty in fixing a limit to the area of compensation, because the conditions varied so much in each case. The limit depended almost entirely upon the geological conditions. Each case should be dealt with on its merits, without limitation of distance. He did not think they could fix on a distance limit which would not do injustice in a great many cases. In equity, whoever did damage by depleting water in a neighbourhood should compensate; but the damage should be proved. With regard to water in transit, he did not think intermediate authorities should have an absolute right to demand a supply. Each case should be dealt with when the Bill providing for the taking of the water was before Parliament. The matter should not be left to the Local Government Board. There were peculiar conditions in the north-eastern portion of the county of Durham which constituted a strong case why the Bill should not go through in its present form. His authority had a number of pumping-stations there; and there were several collieries whose shafts went through the water-bearing strata. Under clause 4, pumping from the collieries would be just as likely to give rise to a claim for compensation as pumping from the water authority's wells. To put on the water authority the onus of proving that they were not responsible, when the cause might just as probably be the sinking of the collieries through the water bearing strata, would be inequitable. Any Bill for the protection of water supplies should provide for remedying any *bonâ fide* injuiry to a water supply, whether caused by the works of authorized water suppliers or by those of private undertakings. The owners of private supplies—collieries, breweries, railway companies, and other industrial undertakings—should not be specially favoured by being exempted, as they would be by the Bill, from any such claim. When mine shafts were being sunk in the district, pumping was enormous; and it might continue for months, and even, in some cases, for two or three years. It would not be fair to compel authorized undertakers to give compensation in the absence of registration of private supplies. All private water supplies ought to be registered; so that water undertakers would know before they entered on new work what private supplies they were likely to interfere with. The term private water supply should be limited to effective supplies. He did not agree that at present there was any property in underground water. In his authority's statutory area, there were twelve collieries, six private water supplies, and 22 wells sunk for industrial purposes. All drew water in varying quantities. It would be impossible, therefore, fairly to make a claim against his authority unless the extent of the depletion by these other wells and shafts was ascertained. Yet under the Bill the authority would be the only body against whom a claim could be made. Water given as compensation should be given at such cost as the owner or user of the private supply was put to before. Under the Bill as it stood, however, it would be possible for the owner of a private water supply to claim a free supply. In the county of Durham, little or no water was obtained until a depth of 200 feet was reached, and frequently water was pumped from a depth of 300 or 450 feet. It seemed improbable, therefore, that the surface wells above the clay would be affected. Yet it would be difficult for an authorized undertaker to prove that injury was not caused by his works. There was probability of the flow of water to private water supplies being diverted and so injured or diminished in consequence of disturbance of the strata by colliery operations. For years the coal companies in his district had been endeavouring to shift the liability for subsidence to the water companies; and they would take advantage of the Bill to evade their liability for draining wells by disturbance of the strata by mining and by their pumping operations. The principle of protecting both public and private interests had been recognized by Parliament, and should be extended; but he was strongly of opinion that a partial and one-sided revision of the water-works law, as provided in this Bill, would cause confusion, and involve authorized undertakers in great expense and costly arbitrations, and that a comprehensive inquiry into the whole question of the national water supply ought to precede any general revision of water-works law. Valuable information for the purposes of such an inquiry would be furnished if the registration of all water supplies, both public and private, and a record of their condition from time to time were made compulsory. A central or controlling authority would be necessary to obtain a thorough knowledge of all the facts relating to the conservation and allocation of water areas; and this central authority, having the knowledge, could advise Parliamentary Committees on any scheme put forward, with a view to serving the best interests of the community and ensuring that no injustice should be done to any interests unable to protect themselves.

By Lord DESBOROUGH: It would not be fair that local authorities on the route of a supply which was being brought from a distance should have a right to a share of the water. These authorities might be supplied from the surplus (if any) by agreement as a matter of business. The authorities on the watersbed from which the water was drawn had a right to a supply.

Sir ALEXANDER BINNIE, formerly the Chief Engineer to the London County Council, expressed the opinion that the Bill would be improved if it were modified so as to be one merely for the protection of private persons and others interested in the preservation of underground water. The principles adopted by Parliament with regard to supplies derived from surface sources were so just and so well understood that such supplies should be excluded from the purview of the Bill. Although the Bill was called the Water Supplies Protection Bill, it contained no provision for the protection of wells from pollution. While clause 3 followed in general terms the wording of Lord Onslow's Model Clause, it appeared to have a retrospective character. It would be improved if it were amended so as to become operative only in the future. Some provision, such as clause 3, was necessary so that, before any powers for sinking wells were granted, there should be a general public inquiry into all the local circumstances. With regard to clause 4, and the definition of "protected area" in clause 7, he considered that an arbitrary radius of 2½ miles stereotyped in a Public Act of Parliament would be inconsistent with the public interest. The proposal to shift the onus of proof with regard to alleged injury to the water undertakers was most unjust. It would upset the whole law of the country to start

with the assumption that a certain party was *primâ facie* guilty, and then throw on him the onus of proving that he was not. A person accusing a water company should prove his case as every other person making an accusation had to do. Questioned as to whether a farmer or a small landed proprietor would have facilities for proving damage equal to those of a great water company capable of maintaining accurate gauges for proving that the damage was not caused by them, Sir Alexander Binnie said, of course, the poorer man would not be able to compete with the richer body; but it was just the small man who would always, if the Bill passed, hang on the skirts of the undertaker. Legalized blackmailing would go on round the skirts of all water undertakings in the country. The expense of collecting evidence would not be so great as to be prohibitory in the case of private individuals, because if a water company pumped excessively the effect would be felt not by any one individual alone, but by the whole of the community; and the community would be well able to defend themselves. Compensation should be paid by a water company if it was proved that it was doing damage. Referring to clause 4 of the Bill, he said it was only with the greatest possible difficulty that the surface area from which a well derived its supply could be defined. In some cases, wells might affect the underground flow of water at a distance of five or six miles; while in other cases, owing to geological faults or the dip of the strata, they might not affect other supplies within a few hundred yards. It was so difficult to define the course of underground water that the law must remain as it was, or the subject must be dealt with by the most careful local inquiry. With regard to the portion of clause 4 which dealt with possible injury by the subsequent enlargement of authorized works, while it was conceivable that damage might be done by undertakers enlarging or deepening their wells, sinking boreholes, or driving adits so as to obtain a larger quantity of water than was originally contemplated, no obstruction should be placed in the way of a public body charged with the obligation of supplying water increasing the quantity they pumped as necessity might require. The quantity of water that could be obtained from a well was often very uncertain until the well was actually sunk. It would be absurd, therefore, to say that the undertakers must obtain a certain quantity from any particular well. A well, when sunk, however, might prove far more prolific than was originally contemplated; and there was no reason why the undertakers should not avail themselves of this abundant supply for the benefit of their district, so long as they caused no injury to other persons. The whole of clause 4 appeared to aim at preserving the right to sink wells to any extent by private individuals, while depriving public bodies and companies of their statutory rights as landowners—of course, governed by the provisions introduced by Parliament when granting the powers—to sink wells in the first instance. His only suggestion on this subject was that when Parliament or the Local Government Board were sanctioning, after careful inquiry, the sinking of any well, the undertakers should be limited to pumping only such quantity as was necessary for the supply of their district with such reasonable development as, after inquiry, might be considered proper under the circumstances. He considered that the time had arrived for a general inquiry into the whole water supply of the United Kingdom by either a Royal Commission or some other competent body. Year by year the available sources of supply were gradually being absorbed, often to the prevention of the adoption of a well-digested scheme. Such an inquiry would first of all have to undertake consideration of the rainfall of the United Kingdom. Many water areas were being absorbed piecemeal without being utilized to their full advantage; and so parliamentary rights were being acquired, not so much to the exclusion of other bodies as to the spoiling of what, if properly and comprehensively dealt with, might yield better results.

Mr. Joseph Parry, Engineer-in-Chief to the Liverpool Water-Works, said the Liverpool water supply was derived from three different sources—wells sunk in the new red sandstone in and around Liverpool, a gathering ground of 10,000 acres in Lancashire, and the River Vyrnwy. At present Liverpool had power to enlarge and improve its sandstone wells under statutory provisions; and they objected to these provisions being interfered with in any way, as they would be if the Bill became law. Some years ago an unexpected drought occurred, with the result that the water supply to Liverpool had to be greatly curtailed. One of the first things done was to deepen the existing bore-holes and make new ones. This was done without application to Parliament. These works, however, which were essential for the safety of the town, would have been prevented if the Bill had been in operation. Frequently towns like Liverpool and Manchester had to resort to temporary sources of supply when there was an unexpected drought, or pending the completion of works authorized by Parliament. In either case the demand for water might greatly exceed the yield from the resources. In such circumstances, arrangements were often made with riparian owners whereby a certain proportion of the water discharged into rivers as compensation water was retained. Such an arrangement would also be prevented by the Bill. With regard to clause 4, there were a great number of private wells in and around Liverpool drawing water from the red sandstone; and it would be exceedingly difficult to prove that a particular private well was affected by the sinking of, or the pumping from, a public well. If a public authority was to be liable to give compensation, it was only fair that other persons whose operations affected private wells should be placed in a similar position. Water companies were becoming fewer every year; so that what the Committee had to deal with was local authorities. Most of the draining of wells, in consequence of the sinking of wells in the red sandstone, related to shallow wells—wells not exceeding 30 feet in depth, which were, almost without exception, polluted and not desirable for domestic purposes. If a public authority gave a supply to a district, it was a good thing that these shallow wells should be drained, and that the authority should distribute water from a central station. With regard to the question of supplying water to districts on the route of a line of pipes, Liverpool should not be in the position of having its valuable supply reduced in quantity by claims from places along ninety miles of aqueduct. The question of compensation for injury was very difficult when considered in relation to a water undertaking. Speaking broadly, when a person was injured, he ought to have a remedy; but in connection with water-works and public undertakings of this character, they had to consider many questions. At present a water company knew what their obligations and risks were; but with a clause such as clause 4 of the Bill, the risks attaching to the sinking of a well would be very serious, and might prevent authorities from carrying out desirable schemes. He emphatically objected to leaving it to the Local Government Board to decide whether or not water should be supplied en route. This matter was one which Parliament should decide in each case.

When the proceedings were resumed on the 23rd ult.

Lord Belper, the Chairman of the County Councils' Association, detailed the circumstances connected with various water supplies in Nottinghamshire. He pointed out that the underground system there covered a considerable area, and asserted that pumping from one district was bound signally to deplete the water supplies even at a considerable distance. When colliery shafts were sunk through the water-bearing strata, large quantities of water were pumped to waste. A simple remedy for such waste would be provided if those sinking shafts were placed under obligation to bank-back the water. Hydrographical maps of the whole country, showing the water-bearing strata, would be of great use. The Nottingham County Council had found it essential to have such maps of the county in order to protect their own district. He approved of the suggestion that the country should be divided into catchment areas, which would follow the courses of the main rivers and their tributaries, with local boards or committees appointed with the object of conserving the water in each catchment area. In fact, the County Councils' Association, after full inquiry, drafted a Bill some years ago for the purpose of constituting water authorities with powers for the protection of water supplies in their areas. The principle that a district had first claim to the water in it might be embodied in a Bill, and then it could be left to Parliament, in individual cases, to apply it. It was very bad policy to allow the water for which collieries were responsible to run to waste. Generally speaking, he was in favour of the Bill. There should be public control over the water supply of a district. No one should be at liberty to take water without regard to other people.

Mr. J. H. Lewis: I understood you to say that an individual ought to be compensated for loss clearly sustained by the sinking of a well and the artificial depletion of his water supply. On the other hand, if a public authority were to sustain loss by the sinking of a private well, should the public authority have an equal right to compensation?

Lord Belper said he would not like to express a very definite opinion with regard to equal rights. He had great sympathy with a private individual, and he thought it was quite as important to protect his rights as it was to protect the rights of anybody else. He did not think the common-law right of pumping water was intended to enable a man to obtain water and sell it. Water obtained in this way should be limited to what the person required for his own use. There was great danger of undertakers acquiring land for the purpose of pumping without applying to Parliament or to the Local Government Board. He did not see how they could give the Bill retrospective effect unless they compensated undertakers for the cost to which they would thereby be put. Regarding clause 4, particularly from the point of view of Nottinghamshire underground water, his opinion was that it was absolutely impracticable. It was impossible to say whether a lowering of the depth in a particular well was due to the seasons or to pumping, or to both. With regard to the proposal to shift the burden of proof, he held that, in Nottinghamshire at all events, the water undertakers could not prove a negative.

Mr. W. J. Freer, Clerk of the Peace for Leicestershire, said it was difficult to conceive a district which required to have more care exercised for the preservation of the small supplies of good-quality water which existed than his county. He was in favour generally of the Bill, but considered the county councils should be authorities under it. As to placing on water undertakers the obligation of proof that damage was not caused by them, he said the case was so complicated that it would be rather hard to do so. The County Councils' Association generally approved of the Bill.

Mr. Percy Griffith, the Secretary of the Association of Water Engineers, said the provisions of the Bill would very considerably increase the charges imposed on the water authorities of the country; and as these charges would ultimately fall on the consumers, his Association urged that the interests of private consumers, as well as, if not in preference to, the interests of private owners, should be considered. It was a popular fallacy that water companies worked for dividends, and were on a totally different basis from local authority water undertakings. If there were a general inquiry, evidence should be obtained as to the cost of capital in both cases. Generally, the dividends paid by water companies were equivalent to, and not, as a rule, in excess of, the amount of interest and capital charges which local authorities had to meet. Forty-six water authorities, representing three-and-a-quarter million consumers, had passed resolutions in opposition to the Bill. His Association did not understand why the provisions of a Bill affecting public interests did not apply to Scotland and Ireland. Clause 3 should not be made retrospective or of general application. While his Association did not object to a clause in a Private Bill the operation of which was confined to the prevention of the abstraction of water from a site not specially authorized by Parliament, they submitted that the clause went much beyond this, and was very undesirable in the public interest. The clause was very indefinite as regarded the information which might or might not be required under it. Many of the authorities he represented would object to the restriction. If he had to choose between specification of works or specification of the amount of water, he would select the latter. Procedure by Provisional Order should be continued. Undertakings constructed under section 51 of the Public Health Act, 1875, should, if the Bill was passed, be exempted from its operation. With regard to clause 4, the Association urged that it was necessary for each case of compensation to be judged according to the local conditions, which varied considerably. This clause, and the definition of "protected area," could not possibly apply to gravitation supplies. There were cases in which compensation was right and proper. Each case should be considered on its merits. He did not, however, see how under a General Bill such consideration could be given. Generally, the onus of proving that depletion of private sources was not due to the works of the undertakers could not equitably be placed on the water authorities. Compensation required under the general law should not exceed the restoration of the conditions as to quality, quantity, &c., existing

previously to depletion, or an equivalent in money; and any provisions in the general law relative to compensation for depletion should be applicable not only to owners of private water supplies against water authorities, but also to water authorities against owners of private sources. He very strongly opposed any alteration of the law that a person claiming damages should prove his case. There were many instances in which water supplies were being seriously interfered with by works of those who, according to the Bill, were private owners. In the interests of public health, as well as in the interest of justice, it was necessary to protect the public interest before, rather than after, the private interest. If the Bill were passed, unwarranted claims would be made. If the Committee adopted the idea of throwing the onus of proof on water authorities, it would follow that the water authorities must be given specific and not general power to go on the lands and property of the private owners making the claim. They had not this power at present. With regard to clause 5, the Association objected to it, because they held that it would allow a district council, on a line of pipes, whose area had been allotted to an authorized undertaker, to go to the Local Government Board and demand a supply of water in bulk from the authority bringing the water from a distance. The parenthetical words in the clause allowing this to be done should be deleted. The clause needed defining in a practical way. Clause 6 appeared to be inconsistent with the opening words of clause 4. If existing statutory powers were to be subject to abrogation by a General Act, the liabilities of water authorities should not be exempted from the same effect. Select Committees, when passing Water Bills, considered liabilities and powers together; and in future legislation the two should still be considered together.

Mr. EDWARD SANDEMAN, the Engineer to the Derwent Valley Water Board, also gave evidence on behalf of the Association of Water Engineers. Speaking with special reference to gravitation supplies, he said his only objection to clause 3 was that it would prevent small authorities from constructing works without applying to Parliament. With regard to clause 4, the words "private water supply" and "protected area," as defined by clause 7, made the clause apply to gravitation works. It appeared that the idea of a protected area was originally intended to apply to wells and boreholes taking underground waters, and that its extension to upland waters was an inadvertence. The expression "protected area" was defined as the area within a radius of 2½ miles from the works; and hitherto it had been used only in connection with underground supplies. He could see no reason to make it applicable to gravitation works, which should be excluded from the section. In connection with gravitation schemes, it was usual to give compensation by returning a portion of the water to the river or stream affected. If such schemes were not excluded from the clause, compensation would be given twice over. With regard to clause 5, in all schemes upon which a burden of this kind was placed, the district councils seeking supplies should be required to define the points of delivery and the quantities required when the scheme was under consideration by Parliament; otherwise the water authority carrying out the works might be put to unnecessary expense in providing aqueducts of a size which would not be proportioned to the quantity of water passing through them. If water was set aside for the use of the district through which the aqueduct ran, it should be set aside altogether; the quantity being determined when the Act was passed. It was unsatisfactory to provide for supplies being given from surplus water, because the district undertaking the scheme might eventually require all the water that it would yield. The Association recognized the propriety of appropriating a certain quantity of water for the use of intermediate districts through which an aqueduct passed; but the quantity should be definitely limited to a small proportion—at most, 10 per cent. of the whole supply. With regard to the rights of persons on the route, the district most urgently needing water was the one entitled to it. A central authority should be set up to deal with the whole question of water supply.

Mr. WILLIAM MATTHEWS also gave evidence, on behalf of the Association of Water Engineers, with reference to the bearing of the Bill on supplies from underground sources. Clause 3, he said, was quite unnecessary. The Lord Chairman's Model Clause met every reasonable requirement. He strongly objected to the other clauses on grounds nearly all of which had been laid before the Committee.

LEGAL INTELLIGENCE.

A LIGHTING RATE QUASHED.

At the Devonshire Quarter Sessions, held at Exeter last Wednesday, Mr. Spencer Pickering appealed against a lighting rate made by the Parish Council of Morthoe.

Mr. T. E. HAYDON and Mr. W. BERESFORD represented the appellant. No appearance was entered for the respondents, the Barnstaple Union Assessment Committee, the Overseers of Morthoe, and the Parish Council.

Mr. HAYDON said the appeal really was against the whole rate made on the 31st of December last year; but Mr. Pickering, who resided at Morthoe, would be satisfied if the rate for lighting by gas were quashed. The case hinged upon the Parish Council's unsuccessful determination to adopt the Lighting and Watching Act for part of the parish; and the facts connected with these attempts were of some public interest. The objections to the rate were based mainly on the ground that the Act had never been validly adopted for the whole or any part of the parish; that none of the meetings at which the Act was purported to be adopted were legally convened; that the proceedings at these meetings were invalid and irregular; that if the Act had been validly adopted it was for the whole parish, at a meeting held on July 5, 1909; and that no proceedings thereafter were competent for the adoption of the Act for a particular area, until the Act had been abandoned for the parish, under the provisions of section 15 of the Act. On Jan. 6, 1908, a meeting was held to consider the question of adopting the Act, and fifty ratepayers were present. The meeting was irregular, because the majority in favour of adopting the Act was not a two-thirds majority. On Jan. 25, 1909, the Woollacombe Gas Company was registered, and a parish meeting was called. To this Mr. Pickering objected; pointing out that it was not regularly called. Moreover, those who took part in the proceedings were either Directors or shareholders of the Gas Company. The Act was again adopted; and then, extraordinarily enough, the meeting resolved itself into one of part of the parish which it was desired to light. Subsequently the Local Government Board advised the Parish Council that their proceedings of January, 1908, and July, 1909, were of no legal effect. Nevertheless the rate was made; but Mr. Pickering was not served with a demand note. He had, in fact, to go and ask for it. At length, when he gave notice of appeal against the rate, the authorities announced that they withdrew the rate; and Mr. Pickering's Solicitors at once pointed out that the Overseers could not abandon the rate, but that application must be made to Quarter Sessions to quash it.

The CLERK said the whole matter was very simple. If the Court so ruled, an order could be made to quash the rate.

Formal evidence having been given,

The CHAIRMAN announced that the rate would be quashed.

Mr. HAYDON asked for costs as between solicitor and client; but the Bench would only award costs against the Parish Council in the ordinary way.

Winding-Up of the Mid Oxfordshire Gas Company.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Swinfen Eady had again before him the petition presented by a judgment creditor (a debenture holder) for £736. The Hon. F. Russell, K.C., for the petitioner, having reminded his Lordship that the matter stood over on June 7 in order that the Liquidator (Mr. Stephens) might call a meeting of the creditors, and ascertain their wishes with regard to continuing the voluntary liquidation,* said an affidavit had now been filed by the Liquidator giving the result of the meeting, which was an overwhelming majority in favour of a compulsory winding-up order. The numbers in favour of the resolution submitted to the meeting to continue the voluntary liquidation were 3932; against it, 24,760. Under these circumstances, he did not suppose the Company would further resist the order, and it would not be necessary to go into the evidence which had been filed, showing how the petitioner would be prejudiced by a voluntary winding-up. Mr. Christopher James, representing the Liquidator, said he should have submitted, on the question of prejudice, that there was no evidence of it; but as this part of the case had not been opened, it was not necessary to go into it, beyond pointing out that the Liquidator had sworn positively that he was perfectly independent, and had not known or heard of Mr. Preston, whose nominee he was said to be, until the amended petition had been filed. He admitted that the majority of the creditors were in favour of a compulsory order; and he did not know that he could properly ask the Court to disregard their wishes, though the unsecured creditors seemed about equal. His Lordship said the only proper order to make, under the circumstances, was the usual compulsory one.

Bucks and Oxon District Gas Company, Limited.

Last Friday, application was made to Mr. Justice Joyce, by Mr. Hughes, K.C. (with him Mr. Ward Coldridge), on behalf of Miss Eveleigh, a debenture holder, for the appointment of a Receiver and Manager of the undertaking of the above-named Company. The Company was incorporated on May 15, 1907, with a nominal capital of £25,000; and plaintiff was holder of two first debentures of £25 each, which became payable in the event of the Company making default in payment of interest for three months, or of passing resolutions for winding-up. On the 25th of June, the Company passed a resolution for voluntary winding-up, and appointed Mr. G. Montague White as Liquidator. It was asked that this gentleman should be appointed Receiver and Manager. Mr. Galbraith, appearing for the Company, said he could not resist the application. His Lordship appointed Mr. White, who is to act at once, and give security in due course, but not to act beyond Oct. 31 without further order.

A Gas Official Sentenced.

At the Warwickshire Quarter Sessions last week, Ernest Harry Clarke, a clerk, pleaded guilty to stealing various sums of money while in the employ of the Corporation of Stratford-on-Avon. Mr. Maddocks, for the prosecution, said the prisoner had been a trusted servant for years. He was employed in the Gas Department; and part of his duties was to receive the money collected, enter the amounts on a counterfoil, and account for the whole sum. He defrauded his employers by entering a smaller amount than he received, and stealing the difference. The total amount of the defalcations, which spread over three or four years, was about £440. Apart from this offence, he bore an excellent character, and gave the officials every assistance; but the Corporation had no option but to set the case before the Court. The prisoner absconded to Stow-on-the-Wold, but returned and gave himself up. A sentence of six months' hard labour was passed.

* See "JOURNAL" for June 14, p. 705.

It was, of course, only what one would have expected that a Saturday evening should be chosen for a "sudden failure" of the electric light at Pontypool. "Considerable inconvenience," we are told, was caused to tradespeople and pedestrians; and in a large number of instances persons resorted to candles and oil lamps, for which there was a rush. For some time, the market place was in total darkness; and something akin to panic occurred among the people in the large hall. Considerable quantities of goods were stolen from the stalls. The cause of the failure is, it seems, in doubt; but the blame has been thrown upon the main switchboard.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Accounts for the Year.

The Edinburgh and Leith Gas Commissioners had before them on Monday of last week the accounts for the financial year ending May 15. In submitting the accounts, the Treasurer—Mr. John S. Gibb—also lodged an abstract statement to the effect that: The Commissioners will notice that the "abstract" is considerably more detailed than has been the case in former years. The general features are in accordance with the suggestions of the Scottish Office, as confirmed and approved by the Commissioners. The following short statement shows the financial result of the year's operations:—

The balance carried to profit and loss account on the year's working is		£125,361
There has been paid during the year—		
For Edinburgh and Leith annuities . . .	£31,430	
,, Edinburgh-Portobello gas annuities . .	1,028	
,, Amount transferred to sinking fund in respect of annuities redeemed . . .	2,741	
,, Do. in respect of mortgages redeemed . .	2,535	
,, Interest on mortgages, &c.	40,722	
,, Expenses of mortgages	444	
,, Special reserve fund, in terms of 1908 Act	16,686	
		94,586
Showing a net balance on the year's working of . . . . . to which falls to be added the balance brought from the year 1909 (after charging the contributions to the sinking and reserve funds applicable to that year)		£30,774 2,619
Making the total sum at the credit of net revenue account		£33,393
This is subject to the statutory minimum charges for the sinking funds, as follows:—		
(1) For repayment of money borrowed (20s. per cent.)	£11,764	
(2) For redemption of annuities (15s. per cent.)	6,861	
(3) For reserve fund (Commissioners' Gas Order, 1902, section 9), ¼ per cent. on £481,251	1,204	
Together		19,828
Which leaves a balance of . . . . . at the credit of profit and loss account, to be carried forward to next year, or to be added to the reserve fund, as the Commissioners may determine.		£13,565

A further proportion of the costs of the alteration and extension of the offices and workshops at Waterloo Place and Calton Hill has been charged against revenue. The contribution to the special reserve fund, required by the 1908 Act (£15,686) has been met out of this year's revenue, by instructions of the Commissioners.

The gas sold has been 80 million cubic feet more than last year; but the revenue from gas is less by £2894, consequent upon the reduction in price.

The return from residual products has been greater by £2637 than last year.

The present value of 1d. per 1000 cubic feet of gas is £8180.

Under the Commissioners' Act of 1908, the capital of the Edinburgh Gaslight Company (£200,000) has been converted into perpetual annuities, redeemable at any term of Whitsunday or Martinmas, at 28½ years' purchase. The capitalized amount is £570,000, and the amount of yearly annuities, £20,000. The capital of the Edinburgh and Leith Gas Company has been similarly increased in amount from £150,000 to £399,000, with £14,000 of annuities; and the capital of the Portobello Gaslight Company, Limited, has been increased from £20,000 to £24,000, with £1200 of annuities. The total capital authorized is stated at £993,000, and the total annuities at £35,200. Annuities have been redeemed to the amount of £2793, at a cost of £78,149. A year ago, before the conversion of the stock, the total capital authorized was stated at £370,000; and the annuities redeemed amounted to £2646; the cost of redemption having been £28,107. Money has been borrowed on mortgage to the amount of £1,281,250, out of a total authorized of £1,400,000. Of the amount borrowed on mortgage, £118,749 has been repaid; leaving mortgage debt amounting to £1,174,877—a reduction of £28,073 during the year. There are also deposit receipts, bearing interest at the rate of 3 per cent., to the amount of £1500.

The cost of the acquisition of the undertaking is stated at £1,068,933, under deduction of £15,360 received for plant or properties sold or transferred to Granton. Of the sum stated, there was expended upon the acquisition of the Edinburgh Company £599,189; of the Edinburgh and Leith Company, £441,100; of the Portobello Company, £26,794; and of the Corstorphine Company, £1850. The amounts expended since the date of acquisition in 1888 have been: On works, manufacturing plant, &c., in New Street, £26,530; in Baltic Street, £1550; in Salamander Street, £6811; in Portobello, £54; in Corstorphine, £25; at Granton, £841,721; in Assembly Street workshops, &c., £5512; and upon Craigleith quarry and water-main, £5631. Upon main and service pipes there has been expended £192,693, of which £985 was expended last year; upon gas-meters, £64,228; upon office furniture, £363; upon heritable properties not embraced in the works, £9650; upon gas cooking and heating stoves, £13,852 (subject to deduction during the year of £804); and upon the cost of the Commissioners' Act of 1888, £22,671. The total capital outlays of the Commissioners have been £2,246,377, of which £1505 was incurred last year. With deductions amounting to £1849, the capital account stands at £2,244,528.

In November last, the price of gas was reduced from 3s. to 2s. 10d. per 1000 cubic feet to ordinary consumers. The quantity of gas sold during the year was 1,963,184,400 cubic feet—an increase of 80,894,400 cubic feet. The quantity sold to ordinary consumers was 1,708,616,400 cubic feet; to prepayment meter consumers, 71,538,500 cubic feet; and for use in gas-engines, 26,401,200 cubic feet. The revenue from the sale of gas was £281,360—a decrease of £2894. Coke realized (less £5248 working expenses and railway carriage) £32,171—an increase of £1424. Tar brought in £11,480—a decrease of £1298. Sulphate of ammonia produced (less £5150 working expenses) £21,242—an increase of £2513. The total revenue from residual products was £64,893—an increase of £2638. The revenue from all sources was £359,373—an increase of £11,871.

The quantity of coal carbonized was 187,153 tons—an increase of 6533 tons. The cost of coal was £93,605—a decrease of £19,452. The cost of oil for carburetted water gas was £2919—a decrease of £1723. The wages of workmen, &c., carbonizing, amounted to £12,634—an increase of £210. Salaries, wages, and charges at works for general purposes, works staff, &c., amounted to £12,901—an increase of £272. Purifier material, and wages of purifier men came to £861—an increase of £48. Repairs and maintenance of works and plant, tools and implements, &c., at Granton, New Street, &c., and dismantling old works, cost £31,878—an increase of £5482. The total cost of manufacturing gas was £154,799—a decrease of £15,153. Distribution cost £28,255—an increase of £645. There was expended on repairing and fitting up gas cookers, fires, and appliances, £8797—an increase of £6952. Management cost £11,472—an increase of £344. Feu-duties and rents amounted to £625—an increase of £5. Rates and taxes came to £17,388—an increase of £860. Pensions and allowances amounted to £1234—a decrease of £240. The contribution of the Commissioners to the superannuation fund created by the Act of 1908, equivalent to the contributions by the employees, amounted to £1811; and the interest upon the special contribution to the superannuation fund, amounted to £2035. Accidental damages cost £187—an increase of £180. Law and parliamentary expenses amounted to £205—a decrease of £1814. Discounts, abatements, and bad debts amounted to £7202—an increase of £150. The total expenditure was £234,012—a decrease of £1342. There was left a balance of £125,361—as compared with £112,147 a year ago.

Out of the balance of £125,361, and £32,839 brought forward from the previous year, the Commissioners have paid, in respect of annuities, £35,200; interest, £43,256; expenses of mortgages, £445; contribution to special reserve fund, £15,686; to sinking fund for redemption of annuities, £6890; to sinking fund for repayment of borrowed money, £12,104; and to the general reserve fund, £1226, and to the special reserve fund, £10,000. These payments amount to £124,807, and leave a net balance of £33,393.

The Commissioners have expended £80,437 in the redemption of annuities to the amount of £2793. They have, from the sinking fund, invested in mortgages over heritable property £212,010—an increase during the year of £1743. The sinking fund for redemption of annuities amounts to £249,884, and for repayment of money borrowed, to £132,920. The general reserve fund amounts to £19,340; the special reserve fund to £25,973; and the superannuation fund to £5688.

LEEDS GAS-WORKS RESULTS.

The Leeds Gas Committee met last Tuesday—Alderman Tetley in the chair—when Mr. R. H. Townsley, the Engineer and General Manager, presented the financial statement of the gas undertaking for the year to March 31.

The total revenue for the twelve months was £380,500, and the total expenditure £282,179; leaving a gross profit of £98,321, as against a gross profit for the previous year of £95,587. From the gross profits, £52,296 is paid out in income-tax and interest, £37,918 goes to the redemption fund, and £2092 for repayment of stoves. This leaves a net profit for the relief of the city rates of £6016, as compared with a net profit of £5068 for the previous twelve months. The sales of gas show a decrease of 99,234,300 cubic feet, or 3½ per cent., compared with the quantity sold the previous year. This decrease is attributed partly to depression in trade, partly to lessened consumption due to the greatly extended use of incandescent burners, and partly to the extraordinarily bright winter. The latter cause was particularly operative during the quarter ended March 31, when the consumption decreased by 70 million cubic feet compared with 1909. During the year, the net debt on capital account was reduced by £30,446, and now stands at £1,273,524.

Altogether, the report is considered by the Committee to be a satisfactory one.

LEICESTER GAS AND ELECTRICITY UNDERTAKINGS.

Separation of Management.

At the Meeting of the Leicester Town Council last Tuesday, the Gas and Electric Lighting Committee presented a report dealing with the future management of the two undertakings under their control. They were unanimously of opinion that it was desirable that there should be separate management of the gas undertaking; and they recommended that the Council should advertise for a Gas Engineer and Manager at a commencing salary of £800 a year, rising by annual increments of £100 to £1000 a year. With reference to the control of the electricity undertaking, the Committee recommended that expert advice should be taken as to the practicability of amalgamating the administration of the two generating systems of electricity at the gas-works and the tramway power station.

Alderman SMITH, the Chairman of the Committee, in moving the adoption of the report, after referring to the growth of the gas undertaking and the electric lighting department under the control of the late Mr. Alfred Colson, proceeded to remark that the Committee had to consider the question of the future management from two aspects. The first was: "Is it desirable to run each of the two undertakings on its own merits or under separate management?" and the second: "Is it better, in the

public interest, to amalgamate the two works under the control of one special Electricity Committee?" There were probably some advantages and disadvantages in regard to the adoption of either plan. It was alleged, for instance, and probably with some truth, that the Aylestone electricity works had not had a fair chance in competition with gas for lighting purposes, and that under separate management it could do much better; that its present reserve power might be used by the Tramways Committee, and thus improve its day-load and financial position. The advantages of unification might be briefly summarized as follows: (1) The whole electricity production and supply for lighting and power would be under the control of one special Committee, whose duty it would be to supply electricity at the cheapest possible rate. (2) It would stop friction between Committees, and abolish insane and unnecessary competition. (3) Consumers and users of light and power would have free choice in taking alternating or direct current, whichever suited them best, at equal rates. (4) The present ducts, cables, and machinery could be more economically used for the present purposes and future extensions of supply. (5) One central office—part of the present gas offices being available—could be extended, where all requiring electricity for light or power could apply. (6) Amalgamation would mean the retention of the present engineering and clerical staffs, with less friction and better control and economy of management. Having regard to certain engineering difficulties that might have to be overcome in carrying out the changes indicated, the Committee thought they should have the best available expert advice before any change was made. They asked for power, in conjunction with the Tramways Committee, who were equally interested in the change, to obtain such expert advice as the Joint Committee might think necessary, in order to guide them to a right conclusion.

Mr. G. E. HILTON seconded the motion; and, after some remarks, it was carried.

COVENTRY GAS AND WATER UNDERTAKINGS.

At the Meeting of the Coventry City Council last Tuesday, the management of the gas undertaking of the Corporation was warmly eulogized on account of the successful year's working, which had produced a net profit of £18,000; and the Council marked their sense of appreciation by increasing the salary of Mr. Fletcher W. Stevenson, the Engineer and General Manager, by £150 per annum. The result shown above was described by the Chairman of the Gas Committee (Mr. W. H. Batchelor) as the first of a series of good reports which the citizens might confidently expect from the undertaking in future. Naturally there were some who thought the advance granted was too high; and there were two amendments to the Committee's recommendation, which was made with unanimity—one being that a rise of £100 should be given, and the other providing for an increase of £50. The latter was characterized by one councillor as "paltry;" and the Committee's recommendation was eventually accepted. The point was very strongly emphasized that, when Mr. Stevenson was appointed, he was given to understand that if he made the concern a financial success, and showed good results, the Council would reward him accordingly. This he had done; and, apart from his capabilities as Manager, he had saved the Gas Department considerable sums by his great engineering skill, as shown in the design of the new works at Foleshill, of which the report presented embraced the first year's working. Another point impressed with some effect upon the Council was that had Mr. Stevenson been in the service of a private company he would have been paid a higher salary than was now proposed, and that, in fact, there were smaller towns than Coventry where the salary of the gas manager was higher.

In reviewing the past year's results, Mr. Batchelor referred to various economies that had been effected under the improved methods of working, and held out a hope of still better results in years to come. At the same time, he was not unmindful of the keen competition the Gas Department had to face in the matter of the supply of electricity, particularly for power purposes; and he remarked that some of those who previously used gas-engines had now adopted electric motors. Satisfaction was expressed at the continued increase of customers through the prepayment meters; but in regard to gas-cookers, the Chairman mentioned that there was a good deal of expense involved in the frequent removal of users from one house to another—there being a disposition on the part of people to require either a new cooker entirely or to have one already in use thoroughly cleaned and overhauled. This work was necessarily very expensive, particularly when it was considered that as many as fifteen removals not infrequently occurred in one day. Dealing with the proposal to reduce the price of gas by 1d. per 1000 cubic feet to ordinary consumers, and 2d. in the case of those using prepayment meters, it was pointed out that a promise was given, when the new works were opened, that there should be some concession made to small consumers at the earliest possible moment; and the Committee were hopeful that this was only the commencement of further reductions that would be rendered possible by the more advantageous methods of production they now had.

In the course of a short discussion, the view was expressed by one speaker that the price of gas was still very high in Coventry, so far as ordinary consumers were concerned, particularly in view of the substantial nature of the profits shown as the result of the past year's working; but the Chairman explained that, in recommending that only £4000 should be devoted to the relief of the local rates, the Committee had regard to the fact that they must make ample provision for the loss of capital consequent upon the abandonment of the old works—an amount that was estimated at £67,000. Moreover, the Council must not forget that they had exhausted their borrowing powers in respect of the gas undertaking, and that there was a tendency now for large sums not to be voted towards the relief of rates. The Committee were anxious to wipe off the amount referred to as early as they could, and place the undertaking in as favourable a financial position as possible. For this reason, they were proposing this year to make a grant of £13,000 out of the net profits towards the loss of capital. A further point to be considered was that if they went to the Local Government Board for sanction to borrow more money, they might be met by a refusal; so that by keeping the powers they possessed in their own hands, and using the profits earned in the way they thought best, they could avoid the necessity for anything of the kind.

The report was unanimously adopted, together with the recommendations submitted as to the disposal of the surplus.

The wisdom of the step taken by the Water Department some time ago in deciding to acquire an additional supply of water from the Birmingham Corporation, was shown in the excellent report presented to the City Council at the same meeting. The net profits realized as the result of the past year's operations amounted to £5577, against a profit of £2133 in the previous year. Alderman Drinkwater, the Chairman of the Water Committee, in presenting their report, said that but for certain extra amounts that had to be included in this year's accounts, under the new system adopted in the presentation of the figures relating to the department, they would have been able to show a record surplus. Reference was made to the arrangement with the Birmingham Corporation, whereby Coventry has to make a minimum payment of £5000 a year for the water received; but it was pointed out that care was taken to see that the full quantity allowed was used. The city had been well provided for throughout the year; there being no scarcity recorded. It was correct that they had had to make an increase of 25 per cent. in the scale of charges, and though some thought this was excessive, the wisdom of it had been fully justified in the result now submitted. Allusion was made to the additional expenditure incurred upon the department in the last twelve months; and the Chairman said they had to face a further outlay of between £30,000 and £40,000. The satisfactory result shown was due to the increased number of consumers and the successful management of the concern by Mr. J. E. Swindlehurst, the Water Engineer. The Council adopted the report, and decided to apply £3500 in relief of rates.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

Below are given some particulars from the report of the Engineer and General Manager (Mr. W. Langford) on the Longton gas and electricity undertakings, as well as some figures from the accounts relating to the past year's working—that is, to March 31.

The report states that the total quantity of gas made during the year was 155,100,000 cubic feet; being an increase on the previous year of 3,959,000 cubic feet, or 2·6 per cent. The gas sold shows an increase of 2,844,600 cubic feet, or 1·9 per cent. The quantity of gas unaccounted for through leakage equalled 4·59 per cent. There was, says Mr. Langford, a substantial increase in the quantity of gas produced per ton of coal carbonized; and the unaccounted-for gas is very low for a mining district. The amount paid over to the borough fund in relief of the rates was £5000; the total so employed since the purchase of the gas-works by the Corporation having been £73,397. The gross profits on the year's working amounted to £9937. After providing for interest and sinking fund charges on capital, there remained a net profit of £4225, which, together with an amount of £2175 received from the depreciation and reserve fund, has been dealt with as follows: Paid over to the borough fund, £5000; expended on fitting up cottages on the slot system, £295; expended on new mains, £294; on new meters, £713—total, £6302, and leaving a balance of £98 to be carried forward.

With regard to the supply of electricity, the report states that the total number of units generated during the past year was 329,268; being an increase of 55,867 units. The total number sold was 306,186. All new meters, repairs, and renewals of machinery and plant were paid for out of revenue. The average price paid per unit for motive power was 1·49d.; for lighting, 4·5d. The gross profits for the year amounted to £2119, and after deducting the interest and sinking fund charges there was a net profit of £537.

Following the report are the accounts. The first table shows the quantity of gas made, sold, and unaccounted for from 1879 till the past financial year. In 1879, the make was 65 million cubic feet, of which 56½ millions were sold, and the leakage was 13·28 per cent. Last year, the figures were 155 and 148 millions, and a loss of only 4·59 per cent. At the outset of the Corporation's management, the price of gas was 3s. 6d. within the borough; but it was lowered to 3s. in 1885. It had to be put up again in 1901; but it was quickly brought down 3d., then another 2d., and is now 2s. 9d., less 3d. discount, with a charge of 2s. 3d. to 1s. 9d. for power, according to quantity. The next table shows the amounts paid to the borough fund since the gas-works were transferred to the Corporation. They range from £500 in (1899) up to £5000 for the past year. Since Mr. Langford took office, £2000 has been transferred to the borough fund annually for six years, £2500 for three years, then £3000; now £5000. The total capital outlay stands at £158,475, of which £78,475 has been spent on new works; but in March, 1905, a sum of £1450 (not shown in the account) was written off for depreciation. The £80,000 originally borrowed in respect of the gas undertaking, as well as £20,000 subsequently raised, will both be repaid in eighteen years; while a further loan of £10,000, repayable in thirty years from June 30, 1894, will be cleared off in fourteen years. The capital actually employed is: Mortgage loans, stock, and debentures, £132,450; less repaid and in sinking fund £44,340—total, £88,110. As mentioned in the report, the gross profit is £9937; being the difference between revenue, £24,508, and expenditure, £14,571.

The following are the general results of the year's working: Coal gas made, 142,988,000 cubic feet; water gas made, 12,112,000 cubic feet—total, 155,100,000 cubic feet. Gas sold to private consumers, 128,137,000 cubic feet; for public lighting, 18,086,000 cubic feet; used on works, 1,745,000 cubic feet; unaccounted for, 7,132,000 cubic feet. The quantity of coal carbonized was 11,083 tons. The make of gas was 12,901 cubic feet per ton; and the average illuminating power was 15·8 candles, tested with the No. 2 burner. The sale of gas per ton was 12,100 cubic feet. The production of residuals was: Coke, 7204 tons; tar, 743 tons; sulphate of ammonia, 119 tons 6 cwt. They had realized 5s. 6·66d., 1s. 5·28d., and 1s. 9·52d. per ton of coal used.

LINCOLN GAS AND WATER UNDERTAKINGS.

The Past Year's Working.

The audited accounts of the Lincoln Corporation for the past financial year have lately been abstracted under the supervision of the City Accountant (Mr. J. H. Burgess); and the following figures show the progress of the gas and water undertakings.

The quantity of gas sold was 356,590,501 cubic feet, of which upwards of 327,000,000 cubic feet were taken by private consumers. This produced £36,485; the sale of residuals realized £12,371; and the gross profit was £14,235, of which £3000 was used in aid of the general district rate. Redemption of debt accounts for some £8000; and gas cooking-stoves have been purchased to the extent of £1012—the balance carried forward being £1133, or more than £700 in excess of the previous figure. The balance-sheet shows the assets and outlay to amount to £253,268, nearly half of which has been paid off, as the total liabilities are £148,464, and the balance of assets is £104,803.

The water-works revenue account shows that the income last year was in excess of the expenditure by £17,449, out of which had to be paid the interest on, and repayment of, loans, amounting to £10,546, and certain special expenses. The balance standing to the credit of the net revenue account on the 31st of March was £3907. Turning to the capital account, there was a balance due to the Treasurer in March, 1909, of £11,333; and the payments during the year amounted to close upon £46,000. To meet these, £14,229 was raised by the issue of stock, £50,000 was advanced by the Union of London and Smiths Bank, Limited (of the latter amount £13,000 has been repaid), and £1421 has been transferred from the net revenue account. The balance of payments over receipts at the end of March was £4392. Coming to the balance-sheet, the mortgage and stock debt amounts to £160,252. Adding the accounts due to sundry persons and the cash due to the Treasurer brings the total liabilities up to £163,201. The balance of assets, however, amounts to close upon £73,000.

KENDAL GAS AND WATER UNDERTAKINGS.

At the Meeting of the Gas and Water Committee of the Kendal Corporation on Monday last week, the Engineer and Manager (Mr. W. R. Wilson) presented his report for the year ended the 31st of March. It showed that the gross profits of the Gas Department amounted to £3734; and after setting aside £2725 for interest and sinking fund charges, there was a surplus of £1009, out of which the Committee had voted £800 in relief of the rates. The reserve fund remains at £5000; and the sinking fund, including debt repaid, stands at £13,675. The total quantity of coal and cannel carbonized amounted to 7713 tons 18 cwt., being an increase of 55 tons 4 cwt., or 0.72 per cent., on the preceding year. The cost of the coal delivered on the works was £5987, or 15s. 6·28d. per ton. The total quantity of gas made was 84,029,700 cubic feet, being an increase of 1,206,700 cubic feet, or 1·45 per cent. The amount of gas sent out, as shown by the consumers' meters was 77,177,800 cubic feet—an increase of 187,200 cubic feet, or 0·24 per cent. There are at present 1877 ordinary and 1807 prepayment consumers on the books; showing a net increase of 67 ordinary and 246 prepayment consumers over the year 1908-9. The receipts for coke show a decrease of £129; for tar, an increase of £18; and for sulphate of ammonia, an increase of £2 12s. 5d. The price of gas has been reduced from 2s. 8d. to 2s. 6d., and for public lighting from 2s. 7d. to 2s. 4d. per 1000 cubic feet. In the Water Department, the gross profit amounts to £2484. Interest on debentures absorbs £1539 (less £1 15s. 6d. being bank interest), and sinking fund £781; leaving a surplus of £164. The sinking fund, including debt repaid, stands at £10,860. The Committee resolved that the Borough Treasurer should transfer £800 from the Gas Department net revenue account to the general district fund account; and that the sum of £200, being the remainder of the surplus profit, should be carried to next year's net revenue account. As to the surplus profit of the Water Department, they decided that the Borough Treasurer should transfer it to the reserve fund account.

Miners and the Eight Hours Act.—At a conference of miners on the question of amending the Mines (Eight Hours) Act, held at the Westminster Palace Hotel last Wednesday, the following resolution was agreed to: "That this conference, having fully considered the position in South Wales, hereby reaffirm the resolution passed on March 30, 1910, and resolve to resist any amendment to the Mines Regulations Act, 1908, which is not introduced or sanctioned by the Miners' Federation of Great Britain." The resolution of March 30 referred to is the one which authorizes the South Wales miners to agree to the conditions negotiated with the South Wales owners for the continuation of the Coal Conciliation Board, and in it strong opposition was expressed to any amendment of the Eight Hours Act.

Fatal Explosion of Acetylene Gas.—A groom and a nurse were killed and three other persons seriously injured by an explosion of acetylene gas which occurred last Tuesday night at Lord Huntingdon's residence, Sharavogue House, near Birr, King's County. There had been an escape of acetylene gas, which was not considered serious; but as the nursery governess, Miss Jessie Dawne, was going to her apartments with a lighted candle, a terrific explosion took place in a long corridor on the first floor. She received terrible injuries, and succumbed within an hour. A stableman named Joseph Power, who was in the corridor at the time, was killed instantly. At the inquest, William Ennis, the steward, said that he had been working the gas-generator for upwards of two years, and no accident had happened with it. The gas was conveyed into the house by an iron pipe, but the one under the flooring of the passage where the explosion occurred was of lead; and his opinion was that the leakage could have been caused by rats gnawing through the pipe. A verdict was returned of "Accidental death."

PORTRAIT OF THE LATE SIR G. LIVESEY UNVEILED.

At the West Greenwich Gas-Works Institute, on the 24th ult., Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, unveiled a portrait of the late Sir George Livesey, the work of Miss Mabel Robinson, of Balham. The cost has been borne by the members of the Institute; a Committee, of which Mr. Alfred Showell is the Hon. Secretary, having charge of the collection of the subscriptions. Mr. J. F. Braidwood, the Engineer of the Greenwich station of the Company, presided; and there was a large attendance. Before unveiling the portrait, which was covered by a Union Jack, Mr. Carpenter dwelt upon the incalculable results of co-partnership, of which Sir George was the pioneer. He said his interest in the welfare of working men never abated; and nothing gave him greater pleasure than to get into conversation with them. Mr. Carpenter warmly commended the idea of the portrait. He then cut a string, and the portrait, "depicting the noble features of the late Sir George," as he added, was exposed to view, amid profound silence. Mr. Carpenter and Mr. Braidwood were cordially thanked for the part they had taken in the function, and it was brought to a close.

SOUTH METROPOLITAN CO-PARTNERSHIP SCHEME.

Its Coming of Age.

The first article in the "Co-Partnership Journal of the South Metropolitan Gas Company" for July is on "The Coming of Age of Co-Partnership." It is by Mr. Charles Carpenter, the Chairman of the Company, who offers the following remarks on the subject.

Under the name of the "Bonus Scheme" our co-partnership came into being in the troublous year of 1889; and it has now, therefore, had existence for twenty-one years. Sir George Livesey often related the circumstances which led up to its conception; and these need not now be recapitulated. Its great object was to improve the relationship between the Company and its employees, and at the same time to give them the opportunity of bettering their lot in life. With the present declaration of bonus at the rate of 8¼ per cent. upon all salaries and wages earned during the past twelve months, the amount of money credited in this way to the Company's employees now exceeds half-a-million pounds sterling. This remarkable figure represents the sum of what has been paid over and above wages as the Company's return for the loyal and intelligent service of its large army of workers during the period under review. A friend of mine often applies to us a remark of an eminent statesman, now deceased, and says "We are all Socialists." Well, if this is Socialism, we have nothing to be ashamed of in the designation. I think, however, the similarity ends with the name.

With the welfare of working men and women near and dear to his heart, Sir George saw the fallacious basis upon which rested most of the socialistic teaching; and he set himself to work to devise a more practical one, for which his intense sympathies and wide experience so eminently fitted him. His great ideal was the formation into a new class, though under an old name, of those who, whether labourers or artisans, toil for a daily or an hourly wage. A fundamental part of the new order of things was a plan to give greater continuity and certainty of service. To this end, a system of agreements was instituted; and instead of following their vocation under the uncertain tenure of an hour's, a day's, or even a week's notice, workmen were assured regular and continuous employment for periods varying from three to twelve months.

Furthermore, beyond the wages which custom and trade societies had decreed as fair to live within and provide not only for a summer holiday but an occasional rainy day, a part of the varying profits of the undertaking was set aside year by year for the employees' benefit, and invested by the purchase of shares in the Company's business. These shares are bought in the open market, transferred to the workmen in their own names, and inalienably held by them. Surely the possession of such securities is bound to bring about a feeling of freedom and independence attainable in no other way. Must it not make a man less fearful and more self-reliant if he feels he has the means in his possession to run alone for a few weeks or a few months, instead of having to pass his life in complete dependence, living from hand to mouth?

Co-partnership has become as integral a part of our business as the supply of gas. I make this statement with firm conviction and full deliberation. But neither in gas supply nor in co-partnership must we be content with matters as they are. Undertakings which do not progress recede. I believe there is no such thing as standing still. Our aim must be to promote the economic use of gas in every way; and the greater the return the consumer gets for the money he spends with us, the more he is likely so to spend. And the same principle is true of the bonus. The more the employees invest their savings in the Company, the greater their interest in it becomes and their power to contribute to its prosperity. We cannot expect the whole half million to be in existence to-day as the employees' holding in the Company; but I do beg all to use their utmost endeavour to increase the amount.

Its Cash Value.

In the same number of the publication referred to in the opening paragraph, there is shown, from some figures furnished by the Chief Accountant of the Company (Mr. Sims), the money value of the co-partnership bonus to a workman earning the very moderate wage of 30s. a week. If such a man had decided at the inauguration of the scheme to leave his bonus and interest untouched, it would in the past twenty years have accumulated to £175 12s. 6d., thus: Withdrawable account, £108 15s.; trust account, £66 17s. 6d. This represents the cash value of the bonus to a man earning his 30s. weekly. Other amounts would be proportionate—*i.e.*, for a man with £2 per week, the figures would be one-third more.

ABATEMENT OF THE SMOKE NUISANCE.

Deputation to the Local Government Board.

A deputation representing nineteen Municipalities (including Manchester, Liverpool, Glasgow, Belfast, Bradford, Leeds, Cardiff, Llandudno, and Brighton) and several public associations waited upon the President of the Local Government Board (the Right Hon. John Burns) last Wednesday, and presented a memorial on the subject of preventing the pollution of the air by smoke.

The memorialists set forth the evil effects of the smoke nuisance, and referred to the steps taken by the Legislature to cure the evil. This, they said, was curable by the application of thought and an expenditure on apparatus, which, carefully used, was accompanied by economy of fuel. Though the Public Health Act, 1875, intended the Local Government Board to take action on the failure of a local authority to do so, the memorialists considered that the Board was not sufficiently equipped. They therefore made a series of requests, among them being the following: "The creation of a Smoke Department of the Local Government Board, with inspectors, competent men with scientific training, who should supervise and report upon the success of the local authorities in keeping down smoke, and give them advice and assistance. If, in the opinion of the Board, these authorities prove ineffective, the Board should itself undertake the control of smoke. In order to remove the domestic smoke nuisance, all new fireplaces should, after a reasonable delay, be inspected and passed as drains and plans are. Believing that cheap gas will be a large factor in the ultimate solution of the smoke question, we trust the Board, in dealing with the borrowing powers asked for by gas undertakings, will absolutely prohibit the pernicious practice of selling gas dear to relieve the rates. This leads to wasteful expenditure, is unfair to large users of gas, and prevents the development of this clean and civilized way of obtaining heat and power."

The deputation, which was received in private, was introduced by Mr. GORDON HARVEY, M.P., who stated that, as a manufacturer owning four mill chimneys, he had practically succeeded in stopping smoke and making a profit.

Principal GRAHAM, the Chairman of the Smoke Abatement League, cited figures to show that the existing smoke legislation is a failure over most of the country. He said that seven towns were endeavouring to carry out the law—viz., Liverpool, Manchester, Glasgow, Birmingham, Bradford, Nottingham, and Sheffield. The total number of prosecutions instituted by these towns came to 2181 in the two years 1903 and 1904; leaving only 164 prosecutions to be distributed over the remaining 102 authorities in two years, or less than one prosecution each per annum, though they had received 6182 official reports of nuisance from black smoke. The new feature of the deputation was that they were there as representatives of municipalities themselves, asking the Local Government Board to come and assist localities where they clearly failed. They did not ask that the subject should be taken wholly out of their control; only that local control should be guided, stimulated, and, where it failed, supplemented by central control, with a staff of inspectors analogous to those who work under the Alkali Acts. It was extremely desirable that there should be in immediate control of smoky chimneys someone more influential and better informed than the ordinary smoke inspector, whose wages were not much above those of a skilled workman, and whose duty it was to control and even to annoy wealthy firms.

Mr. W. B. SMITH, the Convener of the Sub-Committee on Air Purification of the Glasgow Corporation, stated, as showing the necessity for action, that they had in Glasgow last winter one of the most striking examples of the direct effect of smoke-polluted air on the lives of the people. In nine weeks following the 30th of October there was an excess of 1060 deaths; and as the increased number of deaths each week exactly synchronized with the occurrence of black fogs, they thought it was conclusively proved that smoke-fog was the immediate cause of this excessive mortality. The speaker went on to say he had been requested to put before Mr. Burns, for his consideration, the desirability of consolidating the laws against the emission of smoke, and making one uniform code for the whole country. Various local authorities in England and Scotland had Special Acts under which they proceeded; and they varied considerably in the powers they conferred for dealing with this form of nuisance. It seemed to the deputation that all these differences should be put an end to, and that there should be one general law applicable to all manufacturers alike. It was now well known that for many of the smaller industries in a city the gas which was manufactured and sold by the corporation was utilized for the purpose of driving machinery and for heating and cooking purposes. Wherever gas was used in place of coal, smoke was entirely prevented; and hence they desired to specially draw Mr. Burns's attention to the difficulties which lay in the way of some manufacturers as against others in the utilization of this smokeless form of fuel. They referred to the practice which had grown in recent years in various towns in England whereby certain local authorities took an undue amount of the profits from their gas undertakings and applied them to a reduction of the general rates; thus keeping up the price of gas against the consumers, and therefore hindering the utilization of gas, both for heating and for power purposes. They contended that gas should be sold to the community at as nearly cost price as possible, so that its cheapness would encourage its use by the manufacturers, who now had to burn raw coal in small steam-boilers. It was well known among engineers that the smaller type of Cornish boilers, and also all vertical boilers, were among the worst smoke producers. In these circumstances, they appealed to Mr. Burns to take such steps as might seem fitting to prevent the undue amount of the profits of gas undertakings being utilized for the reduction of rates, as they were convinced that this practice not only tended towards some extravagance in public expenditure, but also had a direct bearing on the prohibition of gas as a fuel in the smaller factories.

Alderman FILDES (Manchester) and Mr. LEACH (Bradford) having given particulars in regard to the smoke nuisance in their respective towns,

Mr. BURNS said he sympathized entirely with the objects of the deputation. He had listened with pleasure to what Mr. Harvey had said—that, as a manufacturer, he had proved that smoke was not necessary, and that its absence implied (as he, Mr. Burns, believed it did really imply) the economic management of the concern. Principal Graham had given reasons for preferring national and general rather than local action in these matters. Mr. Smith, of Glasgow, had raised an interesting point as to the action of local authorities in allocating the profits from their gas undertakings in relief of the rates; the effect of this being to make gas dearer than it ought to be, and so preventing its freer use as an illuminant and heater. He frankly sympathized with this view. Briefly, the contentions of the deputation were that penalties should be increased; that central control and inspection should go hand-in-hand with local administration; that there should be general, as distinct from local, action, both in regard to penalties and standards of smoke; and that there should be national and uniform supervision as against intermittent action on the part of a few public-spirited local authorities. Finally, the deputation asked that areas outside cities should have similar penalties to the cities which they adjoined, so that a man could not get over the border and in this way escape smoke liabilities and responsibilities. He associated himself entirely with the real and practical object of the deputation, because, as an engineer, and one who had taken an active part in improving the health and amenities of big cities, he believed that smoke, wherever it came from, was an insanitary nuisance. He considered that smoke was useless, dangerous, and ought to be abolished; and if this was the object of the deputation, he was certainly in entire accord with their views. He believed that a smoky chimney was a sign of waste, an evidence of defective combustion, and a proof of bad stoking. He believed that much improvement could be accomplished if employers would give practical and technical instruction to their stokers, and afterwards some little encouragement in the shape of an extra shilling or two a week in wages. He considered a man who was making money out of a factory, and at the same time polluting the air with smoke, was guilty of a most unneighbourly act. He must, however, point out that there were several difficulties to be faced. Legislation as it at present existed, with the splendid exception of Nottingham, struck only at the factory, the workshop, and large undertakings. He agreed that legislation should be made possible in many of the directions they had indicated; but they had not dealt with one of the chief causes of smoke nuisance—viz., the domestic house. In this matter he anticipated more from general progress than from any legislation for which they were asking. He believed that great progress had already been made in the designing of furnaces, and that electric and gas power were gradually taking the place of detached and badly-constructed factory boilers and smoky chimneys. All these improvements were a step in the direction of abating the smoke nuisance to which they had not perhaps attached sufficient importance. As an example of the extent of domestic smoke, Mr. Burns drew attention to the fact that while there are in Greater London about 35,000 factories and workshops, the dwelling-houses number a million. Unless anthracite was insisted upon (which, he thought, impossible) for every one of these million houses, reform could only be looked for by educating public opinion. He believed that this reform was coming more rapidly, particularly in London, than some people thought, in the shape of improved stoves and grates, and by the supersession of the coal grate and heater by gas and electricity. He had been at some pains to obtain figures that very morning from two large Gas Companies in London—the Gaslight and Coke Company and the South Metropolitan Gas Company—which confirmed his view that, so far as London was concerned, the smoke nuisance was not nearly so bad now as it was ten, twenty, or thirty years ago. He found that these two Companies had between them 1,300,000 gas-fires, gas-cookers, ring burners, or hot-water heaters; and he was of opinion that the use of all this additional gas in lieu of coal must undoubtedly have reduced considerably the smoke nuisance in London. In conclusion, Mr. Burns said he was prepared to take, so to speak, a hill-top view of this question, and to take counsel with the officers of the Board to see if anything could be done on some of the lines suggested by the deputation. But he warned them that there were difficulties in the way more serious perhaps than some of them realized. So far as sympathy with their object was concerned, he assured them that the Local Government Board was with them; and if the final result of their interview were some improvement in the directions they wished, no one would be better pleased than the officers of the Board.

PUBLIC LIGHTING OF ACTON.

Electricity *v.* Gas.

At the Meeting of the Acton Urban District Council last Wednesday, there was a long discussion in regard to proposals for the lighting of the district. It was, however, of purely local interest, and left matters very much as they were before.

Upon the *agenda* was a letter from Mr. Alex. A. Johnston, the Engineer and Manager of the Brentford Gas Company, containing an offer from them in respect of the lighting. He stated that the Directors had for some time had under consideration the means by which the street lighting could be improved, and at the same time reduced in cost; and that they were now in a position to make a proposal which would effect both of these objects. This proposal was: (1) To light the whole of Uxbridge Road and Churchfield Road West by 1500-candle power inverted lamps, fitted on the existing electric arc lamp columns, at a cost for cleaning, lighting, and maintenance of £12 per lamp per annum; and (2) to fix 300-candle power Welsbach self-intensified lamps where there are now eleven arc lamps other than those specified above, for the sum of £5 10s. per lamp per annum—the scheme to include fixing at the Company's expense. Automatic controllers would be put to all the existing gas-lamps; and the price of these lamps would be reduced to £3 each per annum. The high-pressure lamps would be extinguished at 1 a.m., and their places taken by 4-feet Kern lamps similar to those now fitted in most of the side roads; and they would be lighted at the time the others were extinguished. These low-pressure lamps would be fixed on the existing gas-standards. Mr. Johnston pointed out that

this scheme would give the Council not only the best lighted main road in any district outside London, but would also effect a very substantial saving on the lighting account. At the same time, in view of the very heavy capital expenditure involved in carrying it out, a contract for a period of not less than ten years was essential. There was no discussion on the letter.

Mr. Shillecher then proposed another motion, as follows: "That the resolution carried at the special meeting of the Council held on Friday, June 10, 1910, with reference to the handing over of the electricity supply to the Metropolitan Electric Supply Company, be rescinded, and that notice to terminate the agreement be given to the Company." He raised several objections to the proposed arrangements with the Company, and said he had come to the conclusion that the Council could get a supply of gas for £5000, instead of the £20,000 estimated by the Engineer. Mr. Dunsmore said, while he was opposed to giving the contract to the Electric Supply Company, he questioned whether the present was a proper time to discuss the matter, as negotiations were now proceeding. The Chairman (Mr. Schultess Young, J.P.) expressed the opinion that street electric lighting was doomed, unless the cost was reduced. In Acton, under the present charges for current in bulk, the greater the consumption the worse it was for the undertaking. He pointed out that electricity for public lighting was being displaced by gas, and referred to the example of Westminster in adopting the latter illuminant. In the result, the motion was lost.

PLYMOUTH GAS COMPANY AND THEIR EMPLOYEES.

The Annual Outings.

At the invitation of the Directors, the employees of the Plymouth and Stonehouse Gas Company had their annual outings last week. This year the programme included a combined train and coach trip; the parties proceeding by train to Kingsbridge, thence by coach to Dartmouth, and afterwards by train to Torquay and Plymouth. As usual, the guests were divided into three parties; 200 going on Tuesday, and similar numbers on each of the two following days. Luncheon was provided at the Town Hall, Dartmouth, and dinner at Torquay. Mr. Percy S. Hoyte, the Engineer and Manager, was responsible for the excellent arrangements, and personally saw that they were carried out on each of the days.

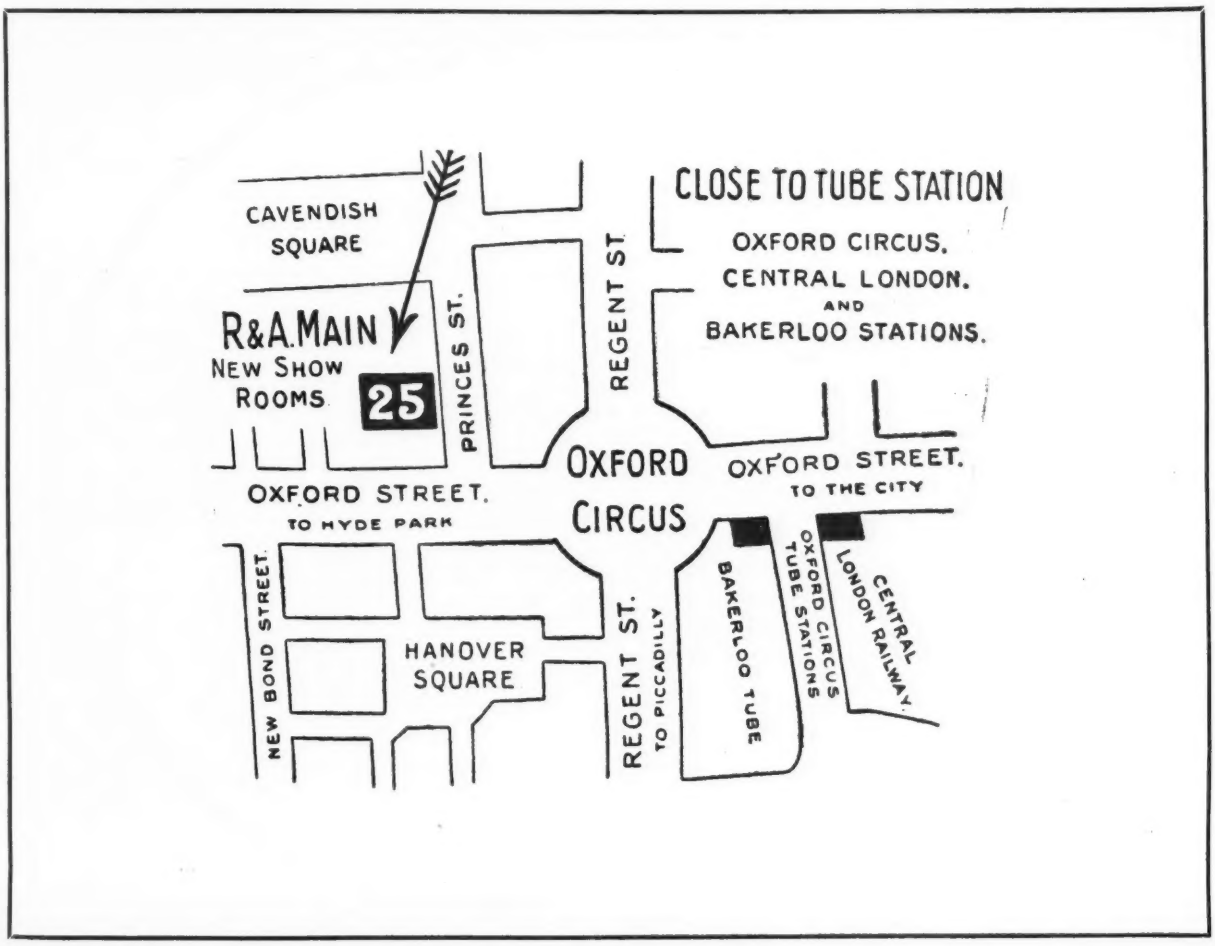
There was a little speech-making after the luncheon on Tuesday, when, at the call of Mr. J. Walters, the foreman of the works, supported by other past and present employees, the Directors and Manager were heartily thanked for their work in the interests of the staff. Special reference was made to the good feeling prevailing at the works, and to the pensions bestowed on old employees, several of whom were included in the party. Sir Joseph Bellamy, in reply, said the Directors were doing as they would be done by, and acted towards the men from a sense of justice. They had been asked out of Plymouth why they favoured a pension scheme without contributions from the men. It was a fad of his that the men should not contribute anything, because they wanted the men to recognize that it was the carrying out of a sense of obligation on the part of the Directors for good work done. A man who passed forty years of his life in one concern, which, through his efforts and those of his colleagues—including those who might be Directors—had been brought to a successful issue, should receive a reasonable pension when he became worn out. The extension of the business outside Plymouth was to be undertaken. It would not produce profit for a long time yet; but it would enable them to make gas in increasing quantities, and to find employment for more men, while it would at the same time enable them to do good to a number of people who wanted more light. The gas-works had been maintained in a thoroughly efficient state for the last twelve months, and thanks were due to the employees for the way in which they had aided the efforts of the Board to bring about the successful results achieved. The reduction in the price of gas by 1d. per 1000 cubic feet meant a gift of £5000 to the consumers and an extra profit to the shareholders of only £500. They knew, however, that the lower the price charged for gas the greater the consumption; and as gas was the poor man's light, the cheaper it was the greater the benefit to the working classes. Mr. Hoyte spoke of the great assistance rendered by the officials of the Company in the carrying on of the works—specially referring to Mr. H. B. Heath, the Secretary, Mr. Richmond, of the Distribution Department, Mr. J. W. Cornish, and Mr. Clark, the Assistant-Engineer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Edinburgh and Leith Gas Commissioners published in another column, bear testimony to the vitality of the undertaking under its present management. The output of gas during the year was the largest the Commissioners have ever had, being 24 million cubic feet over the next largest output—that of 1907-8. The income from the sale of gas was the same as two years ago, when the price was 2s. 9d. per 1000 cubic feet for the first part of the year, and 3s. for the winter season. Last year the price was 3s. for the summer, and 2s. 10d. for the winter season. The largest revenue from gas was in 1901-2, when the price was 3s. 4d. per 1000 cubic feet; and the sum earned was £291,164. During the past five years, the gas consumption has increased by 110 million cubic feet, or, upon an average, more than 20 million cubic feet per year—a very satisfactory increment. During the past year, coal was cheaper than in the year before by over £19,000, which helped considerably in bringing about a favourable financial result; but the fact remains that economic working had more to do with it. For instance, to effect the purification of nearly two billion cubic feet of gas at the cost of £861 for



purifying material and wages is marvellous. The Commissioners are under obligations, imposed by their Act of 1908, more severe than hitherto. They have been able to meet them all, including a special contribution of £15,000 to a special reserve fund, and have £13,565 over. This result is a matter for congratulation. The next balance-sheet will be prepared under the working conditions of a new set of officials—Engineer and Treasurer; and it is to be hoped that it will prove equally satisfactory. We can scarcely wish, in face of the phenomenal prosperity of the past year, that it should be more satisfactory.

I have endeavoured to follow as closely as I could the proceedings at Westminster upon the Gas Bill of the Glasgow Corporation; but in the absence of a set of the documents, it is all but impossible to understand the bearing of some of the evidence and the arguments. It is quite apparent, however, that, subject to the decisions of the House of Lords Committee being acquiesced in by the House of Commons, the Corporation have done well in prosecuting the Bill in the House of Lords. They have, if nothing else had been attained, secured the consolidation of their Gas Acts, rendering administration easier and cheaper; but in the House of Lords the Corporation have had restored to them two things which the Commons refused them—the adjustment of the areas of supply as they wished, and the right to charge differential rates. The Commons' Committee took away a right which the Corporation have all along possessed, of applying profits from the gas undertaking to general purposes—that is, in relief of the rates; and the Lords Committee acquiesce in this decision, so that, to this extent, the Corporation are worse off than they were before going to Parliament at this time. But the right has not been of much service to the Corporation, as, out of profits amounting, in forty years, to nearly £350,000 net, and in gross to very much more, they have only drawn £21,000 from gas profits for the general good. The loss of this power will therefore not be much felt. It is of consequence, however, that the department should have power to differentiate in price. This is a power new to them, in the lighting branch of their business. Its careful application may be anticipated from the lightness of their requisition of gas profits for the relief of rates. The Corporation are empowered to create a reserve fund, which is in accordance with contemporary provisions. Regarded as a whole, it cannot be overlooked that the case for the Corporation has been excellently conducted. The Bill, as amended—shall I say mutilated?—by the House of Commons Committee was presented to the House of Lords Committee by the Corporation in its amended state, and it was left to outside influences to work whatever alteration upon the measure they required, or could obtain. The suggestion that the Corporation were the real movers in the policy of amendment was firmly resented; and we may accept the disclaimer the more readily in that the presumption is permissible that Counsel for the Corporation, seeing that the forces arrayed against them were antagonistic, relied upon their doing the work of persuading the Committee, by which means the ends of the Corporation were served, and the Corporation and Counsel for them have escaped the odium of seeking to pit one of the branches of Legislature against the other. It is to be hoped that, as between the two Houses of Parliament, the points still in question will be amicably adjusted, and that the Corporation of Glasgow will obtain their much-needed Gas Acts Consolidating Act.

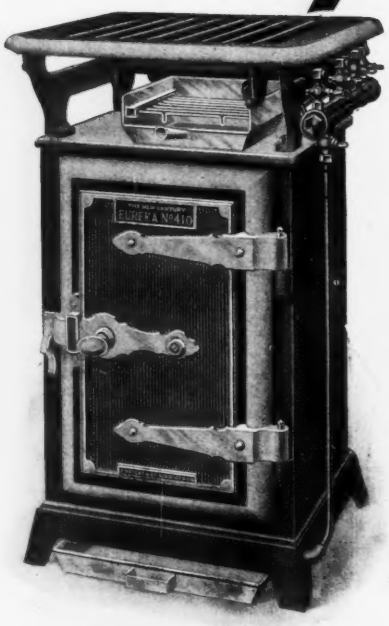
At the annual meeting of the Carluke Gas Company, Limited, held last night, it was reported that the income for the past year had been £3114, and the expenditure £2435; leaving a profit of £679. A dividend of 10 per cent. was declared, and £179 was carried forward. It was reported by the Directors that the works had been maintained in an efficient condition, and that it is expected that additions and alterations which have been resolved upon will be completed in time to meet the winter's demands.

The Muirkirk Gaslight Company earned a profit last year of £223, out of which a dividend of 10 per cent. has been paid.

The Pittenweem Gaslight Company had a profit of £353 on the past year's transactions, and have paid a dividend of 10 per cent.

Sheriff-Substitute Scott Moncrieff, in the Glasgow Sheriff Court, has refused a petition for interdict against the Glasgow Corporation Gas Department, which had been presented by Mr. J. M. Ross, the Liquidator upon the estate of Messrs. Hutson and Son, Limited, Engineers, Glasgow. The Corporation were among the creditors of the Company in respect of unpaid accounts for gas and electricity supplied to their works before liquidation. These accounts the Liquidator refused to pay, whereupon the Gas Department intimated that, failing immediate payment, the gas would be cut off. It was contended, on behalf of the Liquidator, that the Corporation, by threatening to cut off supplies, were endeavouring to force payment of their accounts, and thereby to secure an illegal preference; while they were entitled only to rank for their claim as ordinary creditors. It was also urged that, by their threatened action, the Corporation would deprive the Liquidator of the supplies of gas and electricity which were necessary for carrying on the Company's business, and which, it was contended, he was entitled to get on his undertaking to pay for what was consumed subsequent to the date of the liquidation. On behalf of the Corporation, it was pleaded that they were within their rights in cutting off supplies for overdue accounts. The Court upheld this view. The same subject was before the Court of Session on the 17th of May last, in an application by the Liquidator of a hotel company to have the Corporation of Aberdeen interdicted from cutting off the electricity supply. The step, if taken, it was contended, would put a stop to business, and prevent its being sold as a going concern. Lord Cullen offered to grant interim interdict until caution for payment should be found, which would have enabled the question of liability in such circumstances to be afterwards considered and determined. Caution, however, could not be offered; and in this case also interdict was refused. In both these cases Liquidators have claimed to be in a higher position than ordinary creditors; and in both their claim has been repelled.

The hearing of the action by Mr. W. Ewing, late Gas Manager at Greenock, against the Corporation of Greenock, in which the pursuer sues for remuneration for extra services, is put down for Tuesday morning, in the First Division of the Court of Session. The case comes up by reclaiming note for the pursuer against the decision of Lord Mackenzie, which was adverse to him.



The "EUREKA"

The Pioneer Gas Cooker!

The "EUREKA" for a generation has been doing good pioneer work.

At the present day the name "Eureka" stands for all that is highest in Gas-Stove construction,

Both—

To the Gas Consumer,
To the Gas Authority.

The Standard Cooker!
The Standardised Cooker!!

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

237.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 2.

Sulphate of Ammonia.

June requirements having been provided for, demand has been rather slack, and prices have been somewhat irregular. The closing quotations are £11 15s. per ton f.o.b. Hull, £11 16s. 3d. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. Foreign buyers are not much interested in the prompt position at present, and buyers who have July contracts to cover are not in a hurry to operate. There has been good inquiry in the forward position, but the firmness of makers stands in the way of direct business. Makers' prices are for the most part £11 17s. 6d. per ton for July-December, 1910, delivery, and £12 per ton for January-June, 1911; but no business is reported thereat, and buyers abroad report that they can buy at 2s. 6d. to 3s. 9d. per ton below these figures.

Nitrate of Soda.

This article on spot Liverpool is easier, and the quotations are 9s. 3d. per cwt. for 95 per cent. and 9s. 6d. for refined quality.

LONDON, *July* 4.

Tar Products.

The markets for tar products have been very quiet throughout the past week, and pitch has been weak. The present high prices in this article are such that makers are induced to sell their make as soon as they secure their tar; and as both the Continent and the South Wales buyers appear to have ample supplies for some months ahead, they prefer to hold off in the present state of the market rather than purchase; while the Germans apparently are not only willing to sell pitch at a fairly low figure for delivery over next season, but are also taking a large number of fuel orders from the French makers. Business has been done in London pitch at 35s. per ton; and it is doubtful whether even this price can be secured on the east coast. Creosote is quiet but steady; and it appears to be the general impression that we shall have an improvement in the market for this article towards the end of the year. Benzols are very weak indeed. In the North, 90 per cent. quality has been sold at 5d. per gallon naked f.o.b.; while 50 per cent. quality has been done at 6d. on the same terms. Toluol is quiet, and there is little demand for it. Solvent naphtha is steady; but there is not very much buying just now. Heavy naphtha is quiet, with very few orders in the market. Crude carbolic appears to be slightly firmer, and there is some disposition on the part of Continental consumers to buy for a few months ahead. Crystals, however, are still neglected. Cresylic acid is firm, and prices are well maintained, as is customary at this time of the year. The price realizable for tar has fallen owing to the outlook for pitch.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., *ex* works. Pitch, London, 35s.; east coast, 34s. 6d. to 35s.; west coast, 34s. to 35s. f.a.s. Mersey ports. Benzol, 90 per cent., casks included, London, 7¼d.; North, 6½d.; 50-90 per cent., casks included, London, 7¾d.; North, 7¼d. Toluol, casks included, London, 10d.; North, 9d. to 9½d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3¼d. to 3½d.; solvent naphtha, casks included, London, 1s. 3d.; North, 1s. 2½d. to 1s. 3d.; heavy naphtha, casks included, London, 1s. to 1s. 1d.; North, 11d. to 1s. Creosote, in bulk, London, 2½d. to 2¾d.; North, 2d. to 2¼d. Heavy oils, in bulk, 2¾d. to 2⅞d. Carbolic acid, 60 per cent., casks included, west coast, 1s.; east coast, 1s. to 1s. 0½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article still continues quiet, and buyers are very independent as to forward business. Actual Beckton is quoted at £12; and outside London makes on Beckton terms at £11 10s. In Hull, £11 13s. 9d. to £11 15s. is asked; in Liverpool, £11 15s. to £11 16s. 3d.; in Leith, £11 17s. 6d. to £11 18s. 9d.; and in Middlesbrough, £11 13s. 9d. to £11 15s.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has shown ease of late; but a rather better tone seems to be setting in, more especially for forward deliveries. In the steam coal trade, best Northumbrians are about 10s. to 10s. 1½d. per ton f.o.b. For second-class steams, about 9s. 3d. to 9s. 6d. is quoted; and steam smalls are steady at from 5s. 6d. to 6s. 6d. There is a rather better demand for coal now that prices are lower; but the production is still ample for all the needs. In the gas coal trade, the period of lowest consumption is now passing; but the increase in the carbonization of coal is at first only slow. Exports are, however, fairly good. Durham gas coals are from about 9s. 3d. to 9s. 8d. per ton f.o.b. for the usual classes, according to quality; while for "Wear specials," up to 10s. 6d. is the current quotation. Some sales of gas coal for delivery over next year are reported at practically the same prices as the current ones. In addition, there are two or three contracts, including those for the Ostend Gas-Works for next year, under consideration, and the large sales are slightly stiffening the prices, though not very rapidly. In the coke trade, the tone is quiet. Gas coke is, however, still in small supply, and is firm at about 15s. 4½d. per ton f.o.b in the Tyne or Wear.

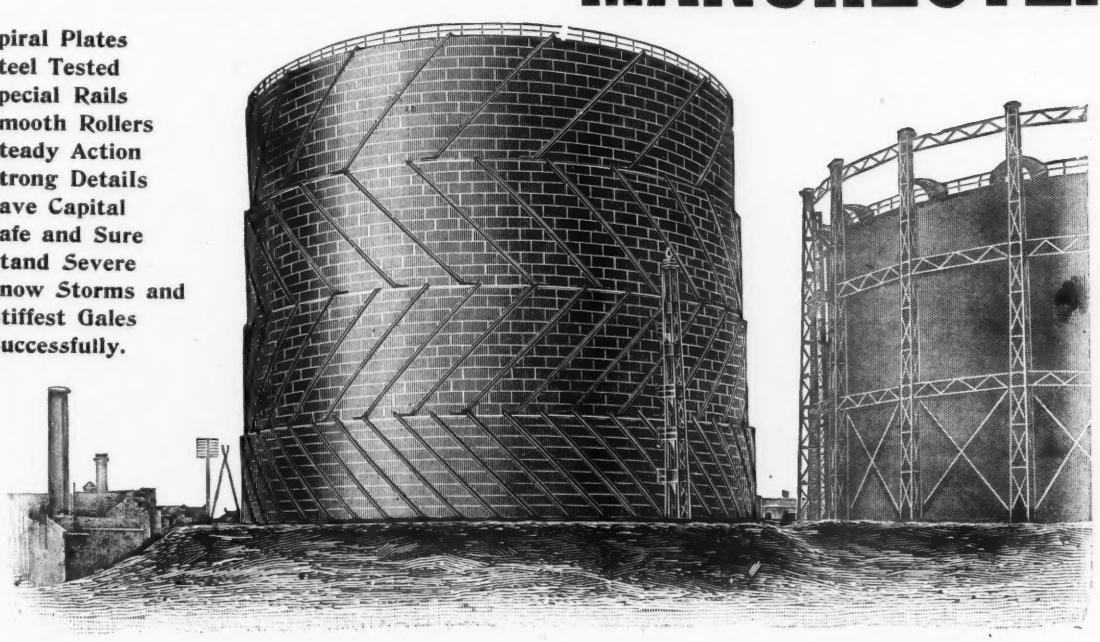
Scotch Coal Trade.

There are signs of improving demand, particularly in the foreign trade, which is about at the height of its season. The home market for steam coal and for washed stuffs is firm. The prices now quoted are: Ell, 8s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 9s. 9d. to 10s.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 320,831 tons—a decrease of 21,083 tons upon the preceding week, and of 38,595 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,593,699 tons—an increase of 623,458 tons upon the corresponding period.

R. & J. DEMPSTER, LIMITED, MANCHESTER.

Leading Makers of SPIRAL GUIDED GASHOLDERS.

Spiral Plates
Steel Tested
Special Rails
Smooth Rollers
Steady Action
Strong Details
Save Capital
Safe and Sure
Stand Severe
Snow Storms and
Stiffest Gales
Successfully.



From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

Torquay Corporation Water-Works.

Members of the Torquay Corporation on Thursday paid their annual visit of inspection to the water-works. Among the points which especially attracted attention was the progress which is being made with the afforestation of the land constituting the gathering-ground. The reservoirs are situated on Dartmoor. On the more exposed portions of the land, larch and Scotch fir trees are being planted. Oak, beech, and sycamore are also being planted; and in the low-lying ground an osiery is being established. The Corporation have laid out a nursery for rearing young trees; and a number will be planted each year. Another matter to which attention was directed was the provision made for aërating the water from the Kennick reservoir. The water is now conducted along the side of a hill and down an inclined plane constructed in ferro-concrete, with a series of steps, by means of which the stream of water is broken into cascades before entering the trunk main. At a luncheon which was served in the Board-room at Tottiford, Mr. T. H. Wills, the Chairman of the Water Committee, who presided, said that the population now supplied with water was 54,000, and the daily consumption was 34 gallons per head. The farming and afforestation operations had been carried out with success. The aëration scheme would materially improve the quality of the water in summer. Mr. S. C. Chapman, the Water Engineer, referring to the planting of trees, said they had not a great deal of money to devote to this purpose, and were feeling their way. The idea was that in time the trees would be a source of revenue, and he thought that the growing of willows for making cricket bats would result in a good profit. The Town Clerk (Mr. F. S. Hex) remarked that the Water Supplies Protection Bill now before Parliament was one of great interest to Torquay. Its progress was being watched very carefully; and if it were considered advisable for the protection of the interests of the town, and the rights of the Corporation, steps would be taken to join with others in opposition to the measure.

Price of Gas at Shoebury.—In the course of a meeting of the Shoebury Ratepayers' Association, Mr. Hatcher remarked that the Urban District Council had been paying 17s. 6d. a ton for coal. Now, as the result of tenders having been invited, they could get it at 15s. 11d.; and if it proved satisfactory, he thought the price of gas should be reduced accordingly. At present, ordinary consumers paid 4s. 3d. per 1000 cubic feet. The Chairman (Mr. W. Neil) said while he was on the Council it was his ambition to bring the price of gas down to 3s. 6d. They started at 5s. 10d.; and now the charge was 4s. 3d. The Council could effect a saving of 1s. 7d. on each ton of coal; but they would never get the price of gas reduced unless they agitated very strongly for it. The hobby of the Council was to make the gas undertaking a paying concern, and it paid now. But to charge the ratepayers a high price so that the works should show a profit, was taking money out of one pocket to put into another. It was decided to inform the Council that, in the opinion of the Association, when the new coal contract was entered into, the price of gas should be reduced in proportion.

The Proposed Improved Lighting of Wandsworth.—The Lighting Committee of the Wandsworth Borough Council report having further considered the subject of the suggested adoption of inverted burners for street lighting. A Sub-Committee inspected the public lamps recently fitted with burners of this description in Clapham High Street, Balham Hill, and Balham High Road; and, with the view of extending the experiment, they had decided that inverted burners should also be fitted to all the lamps in Clapham Common South Side not already provided with them. The estimated cost is £4 19s., and the estimated annual saving £5 10s. The Committee will report further on the matter.

The Lighting of Launceston.—Approval was given by the Launceston Town Council yesterday week to a scheme for the better lighting of the town. The Lighting Committee reported the receipt of a letter from the Gas Company agreeing to the average consumption per lamp being ascertained by 15 meters fixed on certain lamps; the whole of the lamps being of one pattern, and a contract to be entered into for twelve months at the price of 3s. 3d. per 1000 cubic feet. The Mayor (Alderman Trood) said the matter had been under consideration for many years. The provision of new lanterns, &c., would cost £156; but he believed the Council would gain by the change in the system of payment, and that in two or three years the proposed outlay would have been recouped. The time had come to improve the lighting of the town. At present they had three sorts of burners; and those of the batswing type consumed 8 cubic feet of gas per hour, against 6 cubic feet in the incandescent burners. One or two members of the Council suggested that the matter might be delayed. But it was pointed out that the contract must be concluded at once; and the recommendation of the Committee was then agreed to.

Paignton Water-Works Plans.—Further discussion took place at the last meeting of the Paignton Urban District Council respecting the demand which has been made upon the former Water Engineer (Mr. F. W. Vanstone) for the return of certain plans and documents in his possession relating to the works of water supply which were carried out under his supervision. The Water Committee recommended the Council to instruct their solicitors to take the necessary steps to obtain the documents and plans, and to defend any action which the late Water Engineer might bring against the Council to recover fees alleged to be due to him. The Chairman of the Water Committee (Mr. Ham) stated that application was made to Mr. Vanstone in November, 1904, for these plans; but on his pointing out that the signed contract plans were necessary for his use during the construction of the works, they were allowed to remain with him. No question of the right of the Council to the plans was raised until Mr. Vanstone made his claim for payment for extra services. Mr. Hawkins, the new Water Engineer, was appointed in December last; but he had not had the documents necessary for the proper carrying out of his duties. Mr. Vanstone, who is now a member of the Council, criticized the management of the water-works, but made no reference to the dispute between himself and the Council. The recommendation of the Committee was approved.

PARKINSON

"HOLBORN CIRCULATOR"

No. 70.

FOR ATTACHMENT TO EXISTING PIPES.

Provides

HOT WATER

WITHOUT

KITCHEN FIRE.

Some of its chief points are:—

EFFICIENCY.—Great Extent of Heating Surface, Vent Outlet at bottom conserves Heat.

SIMPLICITY.—Only One Water Chamber. No cross Tubes or Soldered Joints.

DURABILITY.—Made of Strong Copper. No Rust. Heat equally distributed.

CONVENIENCE.—Swing-out Pilot for Lighting. Double Burner with separate Taps.

MAY WE SEND YOU FULL PARTICULARS?

THE PARKINSON STOVE CO., LTD.

(INCORPORATING MAUGHAN'S PATENT GEYSER CO.)

STOUR STREET, SPRING HILL, BIRMINGHAM,

AND

129, HIGH HOLBORN, LONDON.

Cheaper Gas for Droitwich.—The Mayor of Droitwich (Alderman Gabb), when the annual report of Mr. F. Shewring, the Gas Manager, was before the Town Council, remarked that the results of the past year's working were very satisfactory. There had been a larger sale of gas, with a smaller make. The Council decided to reduce the price of gas a further 2d. per 1000 cubic feet, making the charge 3s.

Gas Profits at Workington.—The profit on the Workington Corporation Gas-Works for the past year is £3854. The price of gas is 2s. 4d. per 1000 cubic feet; and the quantity that has been sold constitutes a record. In no previous year, it is reported, has the result been so satisfactory, except in 1903, when, however, gas was for nine months 7d. per 1000 cubic feet dearer, and for three months 4d. per 1000 cubic feet dearer than it is now, and when the coal cost 6d. per ton less.

Birmingham Gas-Coal Contracts.—The principal business transacted at a meeting of the Birmingham Gas Committee on Monday of last week, says the "Birmingham Post," was the placing of the coal contracts for the year ending June 30, 1911. It had been generally anticipated that the Committee would have to pay probably 1s. or 1s. 6d. a ton more for their annual supply than they did last year. This would have meant an advance in the coal bill of, perhaps, £30,000 or £40,000; for the contracts to be entered into amounted to 550,000 tons. The Committee, however, have been more fortunate, as they have been able to place the contracts at an advance of only a few pence per ton as compared with last year. The increase in the price is substantial; but it is small in comparison with the amount originally anticipated.

The electric supply at Woking failed on Saturday evening; and was not restored until Sunday. This applied to the whole district; and being Saturday evening tradesmen and private residents were put to considerable inconvenience.

The East Surrey Water Company are about to sell by tender 700 ordinary shares of £10 each; the last day for the receipt of tenders being the 29th inst.

At the Exhibition of Meat and Meat Products and Refrigerating Machinery held at Moscow in May, the highest award (Diploma of Honour) was granted to the Pulsometer Engineering Company, Limited, of Reading, for their exhibit of ice and refrigerating plant.

Hitherto, the water used on the Basildon Estate, in Berkshire, has been obtained from wells. Captain Morrison, M.P., the new owner, has decided upon the erection of a large reservoir, from which pipes will be laid so that in future the cottagers and others will be able to draw water from taps in their own houses.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have received instructions to add a second lift, on their cable system, to No. 3 holder at the Ainslie Street Gas-Works of the Barrow-in-Furness Corporation. The holder is 125 feet diameter and 25 feet deep, and is the sixth order received from the Barrow Corporation for cable-guided gasholders. The firm have also been given a contract to supply and erect two cast-iron tower scrubbers, 15 feet diameter and 40 feet high, by the Leicester Corporation for their Aylestone Road Works, to the design of the late Mr. Alfred Colson.

The residents in Port Elizabeth have lately been afforded, by the Manager of the South African Lighting Association, Limited (Mr. W. Arnott), an excellent opportunity of witnessing the capabilities of the gas-stove in domestic culinary operations, as he arranged for the delivery by Miss Mercer of a series of cookery lectures, with demonstrations, in the Loubser Hall, from the 6th to the 20th ult. The lady holds several diplomas and certificates; and her lectures, which, with one exception, were free, were attended by appreciative audiences. At the opening ceremony, the Chairman of the School Board (Mr. Charles Mackay) presided, and offered some appropriate remarks on the value of a good knowledge of cookery.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Swadlincote Gas Department. Applications by July 12.
ENGINEER AND MANAGER. Leicester Gas Department. Applications by July 16.
WORKING FOREMAN. No. 5258.
TRAVELLING SALESMAN. Laddite Incandescent Mantle Company.

Situations Wanted.

ACCOUNTANT. No. 5259.
ASSISTANT-MANAGER OR MANAGER. T. E. Shadbolt, Grays.
INSPECTOR. No. 5260.

Patent Licences.

GENERATING AND USING HYDROCARBON VAPOURS FOR HEATING AND LIGHTING. L. Duvinage, Brussels.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. July 12.
LOWESTOFT WATER AND GAS COMPANY. July 12.
EAST SURREY WATER COMPANY. Tenders by July 29.
SOUTHEND GAS COMPANY. July 12.
SOUTHEND WATER COMPANY. July 12.
TONBRIDGE GAS COMPANY. Tenders by July 16.

Tank-Waggon for Hire.

CLAYTON ANALINE COMPANY.

TENDERS FOR

Coal and Cannel.

COWES GAS DEPARTMENT. Tenders by July 9.
DARLINGTON GAS DEPARTMENT. Tenders by July 14.
GOOLE GAS AND WATER DEPARTMENT. Tenders by July 23.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.
SMETHWICK GAS DEPARTMENT. Tenders by July 22.
STRATFORD-UPON-AVON GAS DEPARTMENT. Tenders by Aug. 6.

Fire-Clay Goods.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Pipe Laying.

HEDINGHAMS GAS-WORKS.

Pipes, &c.

STOKE-ON-TRENT GAS DEPARTMENT. Tenders by July 7.
WINSFORD GAS DEPARTMENT. Tenders by July 25.

Retort-Bench, &c.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20.

Tar and Liquor.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 20
ROTHERHAM GAS DEPARTMENT. Tenders by July 18.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 18.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,474,000	Stk.	Apl 1	5	Alliance & Dublin Ord.	81 83	−1	6 0 6
310,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
200,000	5	May 12	7	Bombay, Ltd.	6⅛—6⅝	..	5 9 10
40,000	5		7	Do. New, £4 paid	4⅝—5⅛	..	5 9 3
50,000	10	Feb. 25	15	Bourne- mouth Gas and Water Pref. 6 p.c.	29—30	..	5 0 0
311,810	10	,,	7		16¼—16¾	..	4 3 7
75,000	10	,,	6		15—15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	251—254	..	4 18 5
300,000	,,		9½	Do. New	185—190	..	5 0 0
50,000	,,	Aug. 12	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	June 10	4	Do. 4 p.c. Deb.	93—101	..	3 19 3
220,000	Stk	Mar 16	11	Brighton & Hove Orig.	214—217	..	5 1 5
246,320	,,	,,	8	Do. A Ord. Stk.	153—156	+1	5 2 7
460,000	20	Apl. 1	16⅝	British	44—45	..	4 14 8
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	118—120	..	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c.	88- 90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	105—107	..	5 2 10
55,000	,,	June 29	3½	Do. 3½ p.c. Deb.	85—87*	..	4 0 6
250,000	Stk.	June 29	4	Buenos Ayres 4 p.c. Deb.	96—98*	..	4 1 8
100,000	10	—	—	Cape Town & Dis., Ltd.	3¾—4¼	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5⅜—6⅛	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	49 -50	..	6 0 0
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88 -90*	..	5 0 0
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	Feb. 25	5⅝	Commercial 4 p.c. Stk.	107—109	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do.	103—105	..	4 15 3
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	80—82*	+½	3 13 2
800 000	Stk.	June 10	5	Continental Union, Ltd.	91- 96	..	5 4 2
200,000	,,	'	7	Do. 7 p.c. Pref.	135—137	..	5 2 2
492,270	Stk.	—	5½	Derby Con. Stk.	121—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Apl. 1	5	East Hull 5 p.c. Ord.	56—98	..	5 2 0
486,090	10	Jan. 27	12	European, Ltd.	24⅛—24⅜	..	4 17 0
354,060	10		12	Do. £7 10s. paid.	18½—18⅝	..	4 16 0
16,198,673	Stk.	Feb. 10	4⅜	Gas light and Coke 4 p.c. Ord.	104—105	..	4 8 10
2,600,000	,,	,,	3½	3½ p.c. max.	88—90	..	3 17 9
4,002,235	,,	,,	4	4 p.c. Con. Pref.	104—106	..	3 15 6
4,531,706	,,	June 29	3	3 p.c. Con. Deb.	86—92*	+½	3 13 2
258,740	Stk.	Mar. 16	5	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	,,	'	6⅓	Do. do. 5 p.c.	117—119	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17—17½	..	6 5 9
131,000	Stk.	Mar. 16	7	Ilford A and C	145—147	..	4 15 3
65,780	,,	,,	5⅓	Do. B	109—111	+1	4 19 1
65,500	,,	June 29	4	Do. 4 p.c. Deb.	98—100*	..	4 0 0
4,940,000	Stk.	May 12	8	Imperial Continental	1 8 —180	..	4 8 11
1,235,000	Stk.	Feb 10	3½	Do. 3½ p.c. Deb. Red.	94—96	..	3 12 11
195,242	Stk.	Mar 16	6	Lea Bridge Ord. 5 p.c.	122—124	..	4 16 9
561,000	Stk.	Feb. 25	10	Liverpool United A	219—221	..	4 10 6
718,100	,,	,,	7	Do. B	164—165	..	4 4 10
306 083	,,	June 29	4	Do. Deb. Stk.	104—106*	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean.	4⅛—4⅜	..	6 4 8
560,000	100	Apl. 1	5	Met of 5 p.c. Deb.	100 -102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 27	3½	Monte Video. Ltd.	12½—13	..	5 7 8
1,775,892	Stk.	Feb. 25	4⅜	Newc't e & G't sh'd Con	62¼—10⅝	−½	4 4 6
529,435	Stk.	June 29	3½	Do. 3½ p.c. Deb.	8)—91*	..	3 16 11
55,940	10	Feb. 25	7	North Middlesex 7 p.c.	13½—13⅝	..	5 1 10
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	138—140	..	5 14 4
60,000	5	Apl. 1	8	Ottoman, Ltd.	6—6½	..	6 8 0
31,800	53	Feb. 25	13	Portsea Island A.	134—136	..	5 1 0
60,000	50	,,	13	Do. B.	126—128	..	5 1 7
100,000	50	,,	12	Do. C.	119—121	..	4 19 2
114,800	50	,,	10	Do. D and E.	100—102	..	4 18 0
398,490	5	Apl. 29	7	Primitiva Ord.	7¼—7½	..	4 13 4
796,980	5	June 29	5	Do. 5 p.c Pref.	52—54*	..	4 10 11
488,903	100	June 1	4	Do. 4 p.c. Deb.	97 -99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97—99*	..	4 0 10
250,000	10	Apl. 1	9	San Paulo, Ltd.	15¼—16	+¼	5 12 6
62,500	10	,,	6	Do. 6 p.c. Pref.	11¾—12¼	..	4 18 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49- 50*	+1	5 0 0
135,000	Stk.	Mch. 16	10	Sheffield A	232—234	..	4 5 5
269,984	,,	,,	10	Do. B	232—234	..	4 5 5
523,500	,,	,,	10	Do. C	232—234	..	4 5 5
70,000	10	May 27	7	South African	11—11½	..	6 1 9
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	120—122	..	4 9 7
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	80—82	..	3 13 2
209,820	Stk.	Mar. 16	8	South Shields Con. Stk.	157—158	..	5 1 3
605,000	Stk.	Feb. 25	5⅜	S'th Suburb'n Ord. 5 p.c.	121—123	..	4 12 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	121—123	..	4 1 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 12	5	Southampton Ord.	110—112	..	4 9 3
120,000	Stk.	Feb. 10	6⅔	Tottenham A 5 p.c.	133—135	..	5 1 9
453,940	,,	,,	5⅜	and B 3½ p.c.	113—115	..	4 13 6
149-470	,,	June 29	4	Edmonton 4 p.c. Deb.	57—59*	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97- 99*	+½	5 1 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p c max.	113—115	..	4 6 11
255,636	Stk.	Feb. 25	6⅔	Wands- B 3½ p.c.	139—141	..	4 14 0
79,416	,,	June 29	3	worth 3p.c. Deb. Stk.	73—75*	+½	4 0 0

Prices marked * are "Ex div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 248 Holborn.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

TAR WANTED.
Telephone: Central Manchester, 7002.
Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

J. E. C. LORD, Ship Canal Tar Works,
Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

BRISTOL RECORDING GAUGES AND THERMOMETERS.
J. W. & C. J. PHILLIPS, 23, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

GAS TAR wanted,
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
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ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
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SPENT OXIDE PURCHASED IN ANY DISTRICT.

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J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

KRAMERS AND AARTS WATER-GAS PLANT.
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

EDGAR OF HAMMERSMITH
FOR
STREET LIGHTING LAMPS AND ACCESSORIES.
BLENHEIM WORKS, LONDON, W.
Telegrams: "GASOSO LONDON." Telephone: 14 HAMMERSMITH.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, June 21, p. 914.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

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(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.

SULPHURIC ACID.
SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.
with which is amalgamated WM. PEARCE & SONS, LTD.
86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

"HALLITE" Asbest s High-Pressure Sheeting.
HALLITE DOUGLAS, LIMITED, 106, Leadenhall Street, LONDON, E.C.

F. BOYALL, Contractor for Painting GASHOLDERS, OIL-TANKS, ROOFS, and all kinds of LOFT and other PAINT WORK.
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SULPHURIC ACID.
SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

WARNER & VAN DER BIESEN,
ZWOLLE, HOLLAND.
DIGGERS AND SUPPLIERS OF THE
FINEST DUTCH BOG ORE.
(Natural Oxide of Iron.)
Best Percentages. For lowest Quotations to any Port, Station, or direct into Works, please apply to—
LONDON OFFICES: 6, LEATHER LANE, E.C.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Acorington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

CITY and Guilds Examinations in Gas Engineering and Gas Supply. Students who have done badly at the recent Examinations should join Mr. Cranfield's Correspondence Classes for next Session. Assistance ample, individual, and private.
Write at once, 11, Avondale Place, HALIFAX.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, June 21, p. IV. of Centre.
ALDRIDGE AND RANKEN,
39, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy, London." Telephone: 5118 Westminster.

APPOINTMENTS.—Ambitious Men of
Parts invited to write—
HERBERT GREATOREX,
APPLICATION SPECIALIST,
BEECHWOOD, MATLOCK.
Specimen of many results:—
"Have got the job. Quite a good start.
To you the credit is due, and I think your
fee the best Investment I ever made."
BUSINESS IS REVIVING. WRITE NOW.

IT is Worth Your While to Buy Direct.
The RELIANCE LUBRICATING OIL COMPANY supply the best value in NON-CORROSIVE LUBRICANTS—viz, Motor Waggon Oil, 1s.; Motor Car Oil, 2s.; Engine, Cylinder, and Machinery Oils, 1s.; Axle Oil, 10½d.; Exhauster Oil, 10d.; Special Cylinder Oil, 1s. 4d.; 650 T Cylinder, 2s.; Special Engine Oil, 1s. 4d.; Gas Engine and Oil Engine Oil, 1s. 6d.; Refrigerator, 1s. 9d.; Renown Engine Oil, 11½d.; and Astral Disinfectant, 2s. 6d. per gallon. Barrels free, carriage paid. Solidified Oil, 25s. cwt.
The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower Street, London, E.C.

CORRESPONDENCE CLASSES.
GAS Engineering and Gas Supply.
City and Guilds of London Institute.
Teacher: HERBERT LEES (Silver Medallist), Assoc.M.Inst.C.E., Engineer and Manager of the Hexham Gas Company, Lecturer at Rutherford College, Newcastle-on-Tyne.
For Terms, &c., address Elvaston Road, Hexham.

CHELTENHAM GASLIGHT AND COKE COMPANY.
NOTICE, the Directors have made an
APPOINTMENT to the Vacant Office of Chief Clerk.
All Applicants are THANKED.

SITUATION wanted by a Young Man,
Son of a Gas Manager, as ASSISTANT-MANAGER or MANAGER of Small Works, or place of Trust. Has been thoroughly Trained for Gas Management.
Address Thos. E. Shadbolt, Gas-Works, Grays.

INSPECTOR (Age 35), Married,
thoroughly Practical, Seeks ENGAGEMENT, London or Provinces. Twenty years with late Company.
Address No. 5260, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ACCOUNTANT (Age 29), with Expert
Knowledge of Gas Accounts and Secretarial Experience, desiring change, is open to accept RESPONSIBLE POSITION in Gas Company's Office.
Address No. 5259, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, for a Colliery Gas-Works in
the North of England, a WORKING FOREMAN—Handy Man Accustomed to Generator Furnaces and Exhausters. House and Coal provided.
Apply, by letter, stating Wages required, to No. 5258, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TRAVELLING Salesman wanted, one
thoroughly acquainted with the Gas-Mantle Trade, and who has established Connections throughout Great Britain.
Apply, by letter, to the Laddie Incandescent Mantle Company, Kingston-on-Thames.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.

THE above Council invite Applications
for the Position of MANAGER (under a Consulting Engineer) of the Council Gas-Works.
The Annual Make of Gas approximates about 47,000,000 Cubic Feet.
The Salary offered is £150 per Annum; and the Appointment will be terminable on Three Months' Notice from either side.
The age of Applicants must not exceed 35 Years.
Applications, stating Age, Experience, and present Position, and accompanied by *copies* of not more than Three recent Testimonials, to be addressed to me, endorsed "Gas-Works Manager," so as to reach me not later than Twelve Noon on Tuesday, the 12th of July, 1910.

W. A. Musson,
Clerk to the Council.

Council Offices,
Swadlincote.

BOROUGH OF LEICESTER.

GAS ENGINEER AND MANAGER.

THE Gas Committee of the Corporation
of Leicester invite APPLICATIONS for the Office of GAS ENGINEER and MANAGER to the Corporation.
The Gentlemen applying must have an Extensive Knowledge of Modern Gas Manufacture, and must be fully competent to Manage a Modern Chemical Works for dealing with the Residual Products.
The Manager will have charge of the Commercial as well as the Manufacturing Departments, and will be held responsible for the General Supervision and Control of the Office and Works. He will be required to Devote his Whole time to the Duties of his Business.
The Salary will commence at £800 a Year, rising, subject to the Services of the Gentleman Appointed being approved by the Committee, by Annual Increments of £100 to £1000 a Year.
Applications, stating Age, Previous Experience, Present Occupation, and date when Duties can be taken up, together with *copies* of not more than Five recent Testimonials, and endorsed "Gas Manager," must reach me on or before Saturday, the 16th day of July next.
Canvassing is strictly prohibited.

H. A. Pritchard,
Town Clerk.

Town Hall, Leicester,
June 30, 1910.

FOR HIRE—One Tank-Waggon suitable
for carrying Benzol, and one suitable for carrying Crude Naphtha.
Address The Clayton Aniline Company, Limited, Clayton, Manchester.

GASHOLDERS—Splendid 45 feet dia-
meter and New STEEL TANK, fixed Complete to Plan and Specification; also 14 feet and 16 feet Diameter GASHOLDERS, with STEEL TANKS. Can be seen temporarily erected. Re-erected Cheap for immediate Sale.
Firth Blakeleys, Thornhill, Dewsbury.

HEDINGHAMS GAS-WORKS, ESSEX.

TENDERS are invited for the Relaying
of about 1½ Miles of MAIN, 4-inch and 3-inch. Pipes supplied by the Company.
For Particulars, Apply to C. G. Grimwood, Sudbury, Suffolk.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to
receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of September, 1910.
The probable Quantities required will be about 200 Tons of Cannel and about 2000 Tons of Gas Coal, which must be freshly Wrought, well Screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the Quantities named.
The Person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating Price per Ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 20th of July, 1910, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not Supplied.
Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. Mullard,
Clerk.

Council Offices, Lymm.
Cheshire, July 1, 1910

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are
prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works for a term of One Year from the 1st day of September, 1910 (or for such longer term as may be contracted for with the consent of the Council).
Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.
Tenders to be sent to the undersigned on or before the 20th day of July, 1910, endorsed "Tar."
The Purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.
The Council do not bind themselves to accept the highest or any Tender.
Forms of Tender are not Supplied.
Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. Mullard,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1910.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to
receive TENDERS for the Supply of MATERIALS and Execution of WORK required in Connection with New RETORT-BENCH and RETORTS.
Specification, Conditions, and all Particulars may be obtained from Mr. W. L. Donaldson, the Council's Gas Engineer.
The Council do not bind themselves to accept the lowest or any Tender or Tenders.
Forms of Tender are not Supplied.
Sealed Tenders, endorsed "Tender for Extensions," to be delivered to me not later than the 20th of July, 1910.

W. Mullard,
Clerk.

Council Offices, Lymm,
Cheshire, July 1, 1910.

COWES URBAN DISTRICT COUNCIL.
(Gas Department.)

TENDERS are invited for the Supply of
4000 Tons of First-Class GAS COAL for the Year ending July 31, 1911.
Sealed and endorsed Tenders to reach the undersigned (from whom further Particulars may be obtained) by July 9.
The lowest or any Tender not necessarily accepted.

E. H. Millard,
Engineer and Manager.

Gas-Works, Cowes, I. of W.

COUNTY BOROUGH OF ROTHERHAM.
(Gas Department.)

THE Corporation of Rotherham are
prepared to receive OFFERS for the Purchase of the Surplus GAS TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Year.
Forms of Tender and Specification may be obtained on Application to Mr. J. S. Naylor, Gas Engineer.
Offers, endorsed "Gas Tar and Ammoniacal Liquor," to be sent to me not later than July 18 next.

W. J. Board,
Town Clerk.

Town Hall, Rotherham,
June 28, 1910.

GOOLE URBAN DISTRICT COUNCIL.
(Gas and Water Works.)

TENDERS are invited for the Supply
of about 8000 Tons of GAS COAL, and 800 Tons of STEAM COAL, or portions thereof.
Particulars and Form of Tender may be obtained on Application to Mr. J. Fazakerley, Gas and Water Engineer, Gas-Works, Goole.
Tenders, endorsed "Tender for Coal," to be delivered to the undersigned not later than Noon on Wednesday, the 20th of July, 1910.

Robert Tyson,
Clerk to the Council.

Council Offices, Goole,
June 28, 1910.

STRATFORD-UPON-AVON CORPORATION.
(Gas Department.)

THE Gas Committee invite Tenders for
the Supply of 6000 Tons of Good Screened GAS COAL or NUTS for delivery during Twelve Months ending Sept. 30, 1911.
Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.
Tenders to be sent in (and will be accepted only on the Forms supplied) not later than Aug. 6, 1910.
The lowest or any Tender not necessarily accepted.

J. S. Cranmer,
Engineer and Manager.

July 2, 1910.

COUNTY BOROUGH OF SMETHWICK.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for
the Supply of about 30,000 Tons of GAS COAL and NUTS and 1000 Tons of CANNEL.
Form of Tender and further Information may be obtained of the undersigned.
Sealed Tenders, endorsed and addressed to the Chairman of the Gas Committee, Council House, Smethwick, to be sent in not later than the 22nd inst.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
W. J. Sturges,
Secretary.

Gas Offices, Council House,
Smethwick.

WINSFORD URBAN DISTRICT COUNCIL.
(Gas Department.)

THE above Council are prepared to re-
ceive TENDERS for the Supply of 1000 Yards of 4-inch and 250 Yards of 3-inch CAST-IRON PIPES, with Spigot and Socket Joints, Bends, Syphon Boxes, &c.
Tenders, endorsed "Gas Mains," to be delivered to the undersigned on or before the 25th of July, 1910.
Specifications and Forms of Tender may be obtained on Application to Mr. F. Sidwell, Manager, Gas-Works, Winsford.
The Council do not bind themselves to accept the lowest or any Tender.

Jno. H. Cooke,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, July 1, 1910.

CORPORATION OF DARLINGTON.
(Gas-Works Department.)

TENDERS FOR GAS COAL.

THE Gas-Works Committee of the above
Corporation invite TENDERS for the Supply of 35,000 Tons of Freshly-Wrought GAS COALS, delivered at the Gas-Works Siding, as required during the ensuing Twelve Months.
Further Particulars and Form of Tender may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.
Tenders, endorsed "Tender for Gas Coal," to be delivered at my Office, Houndgate, Darlington, not later than July 14, 1910.
No pledge is given that the lowest or any Tender will be accepted.

H. G. Steavenson,
Town Clerk.

Town Clerk's Office,
Darlington, July 2, 1910.

COUNTY BOROUGH OF STOKE-ON-TRENT.
(GAS-WORKS.)

TENDERS FOR CAST-IRON PIPES AND WROUGHT-IRON TUBES AND FITTINGS.

TENDERS are invited for the Supply of (*a*) the CAST-IRON PIPES and (*b*) the WROUGHT-IRON TUBES and FITTINGS which will be required at the Burslem, Fenton, Longton, and Stoke-upon-Trent Gas-Works during the Year ending the 30th of June, 1911.

Specifications and Forms of Tender can be had on Application to the undersigned.

The Council reserve the right of accepting the whole or any part of a Tender, or of dividing same as they may consider desirable.

Neither the lowest nor any Tender will necessarily be accepted.

Tenders must be sent to the Town Clerk, Stoke-on-Trent, so as to reach him not later than Twelve o'clock Noon on Thursday, the 7th day of July inst., endorsed "Tender for Piping, &c."

A Clause as to Trade Union Rates of Wages, Hours of Labour, and as to Sub-Letting will be inserted in any Contract for Supply which the Council enter into.

EUSTACE JOY,
Acting Town Clerk.

Stoke-on-Trent,
July 1, 1910.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £10,000 "D" CAPITAL WATER STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Executors of SOLOMON BLAIBERG, Esq., deed.

GAS AND WATER STOCKS AND SHARES,
IN THE
SOUTHEND GAS COMPANY,
SOUTHEND WATER-WORKS COMPANY,
LOWESTOFT WATER AND GAS COMPANY.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

TONBRIDGE GAS COMPANY.

NEW ISSUE OF £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

THE Directors of the above Company give Notice that they will be prepared to receive not later than Twelve o'clock Noon on Saturday, the 16th of July, 1910, sealed Tenders for £1000 FOUR PER CENT. DEBENTURE STOCK, in Lots of £10 each, or multiples of £10.

Minimum Price, £100 per £100 Stock.

Full Particulars and Forms of Tender may be obtained from the undersigned.

JAMES DONALDSON,
Secretary and Engineer.

Offices; 109, High Street,
Tonbridge.

EAST SURREY WATER COMPANY.

SALE OF ORDINARY SHARES BY TENDER.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER SEVEN HUNDRED ORDINARY SHARES, of £10 each, of and in the East Surrey Water Company.

The last day for the reception of Tenders will be Friday, the 29th day of July next, at Twelve o'clock, at noon.

Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Redhill, Surrey.

By order,
A. E. CORNEWALL-WALKER,
Secretary.

Redhill, Surrey,
June 24, 1910.

PATENT.

THE Proprietor of the British Patent No. 10,616/05 for "IMPROVEMENTS IN MEANS FOR GENERATING AND USING HYDRO-CARBON VAPOURS FOR HEATING AND LIGHTING PURPOSES" desires to sell his Patent or to Grant Licences thereof.

All Communications should be addressed, in the first instance, to L. DUVINAGE, Patent Agent, 10, Avenue des Nerviens, BRUSSELS.

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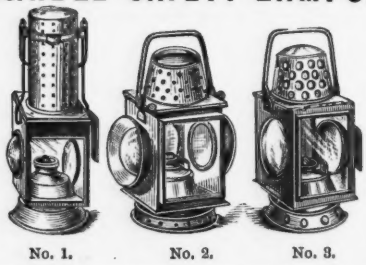

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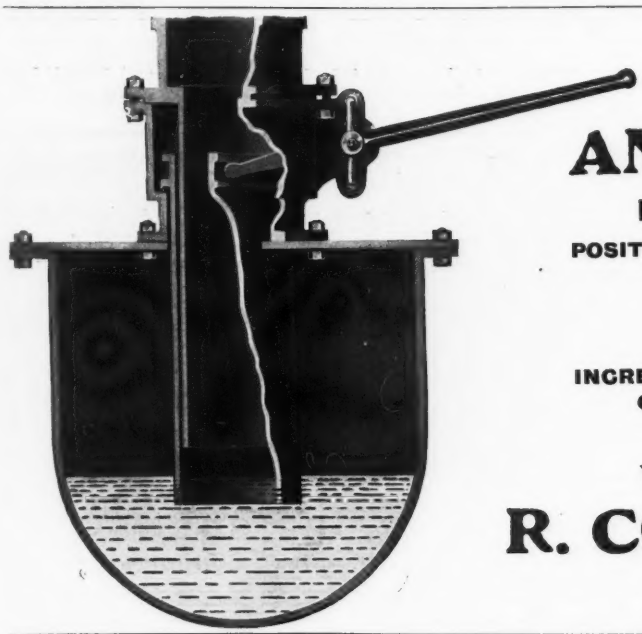

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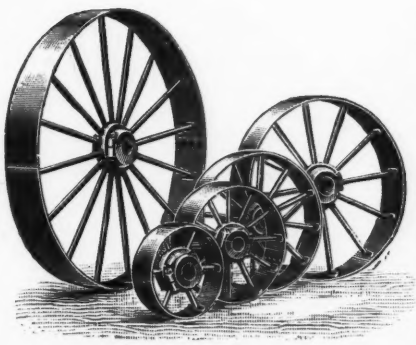

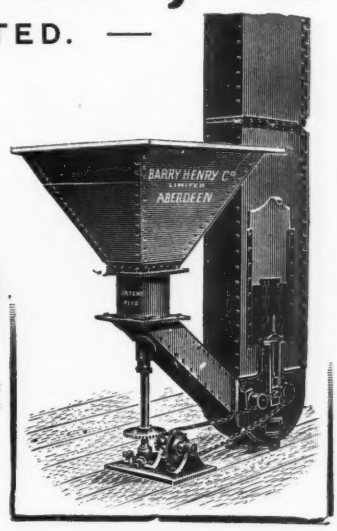

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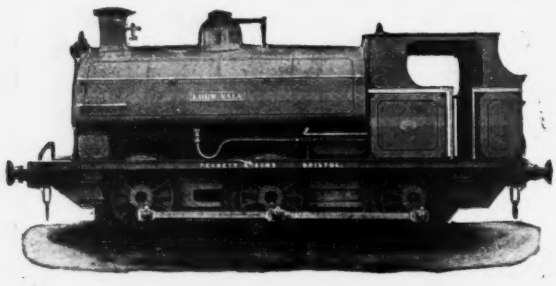

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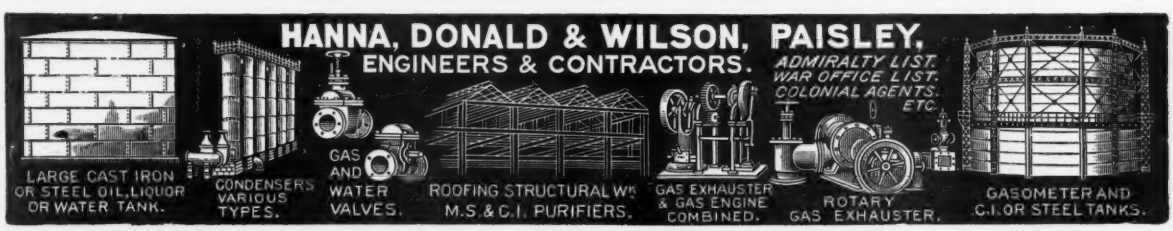
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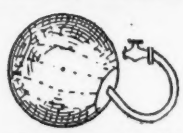

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Value in Pounds of Sperm, 820·20.

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Plants already built and under Construction:

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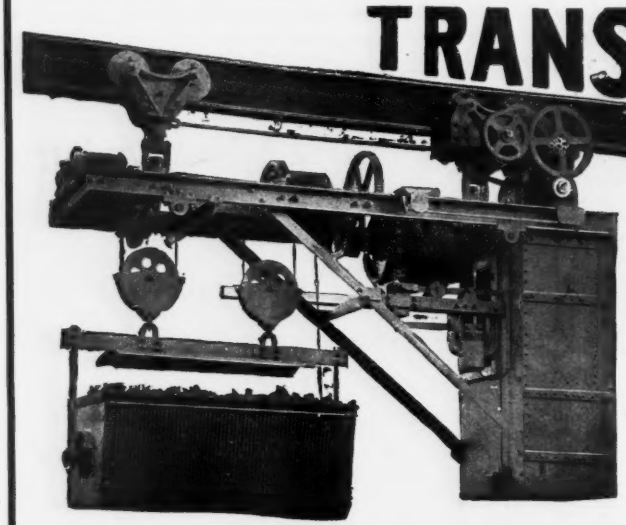

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SILCO BRICKS prevent all settling of setting.

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Welsbach LIGHT

Inverted Arc Lamp, Fig. 623.

Storm Proof—

For Exterior Lighting.

Welsbach-Kern

(Patent) Inverted System

BRITISH MADE.

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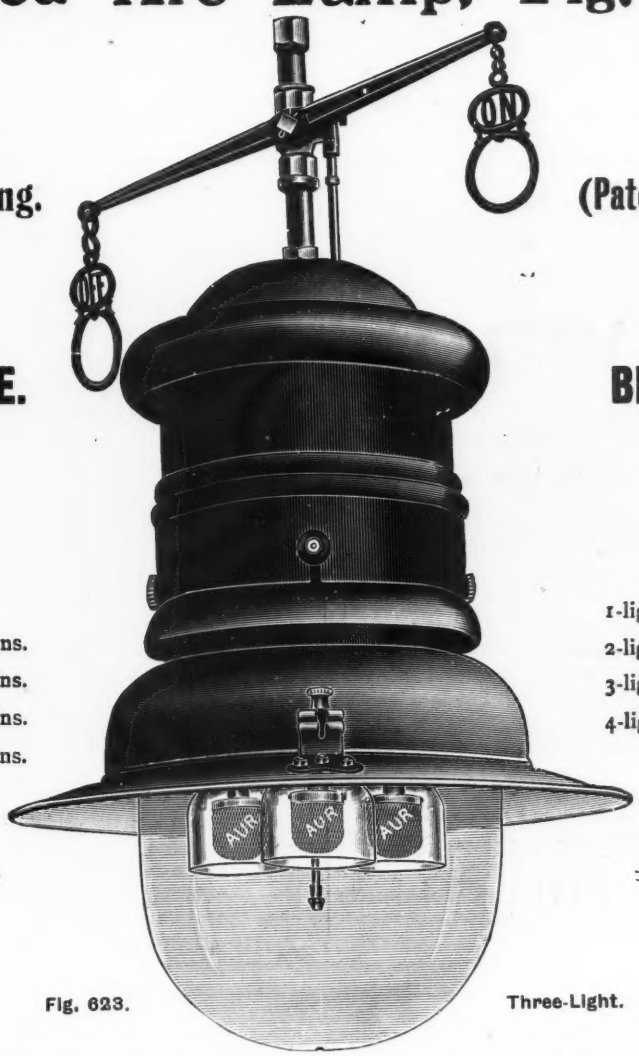

Fig. 623. Three-Light.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*		*Gas per hour.*	*C.P.*	*Steel.*	*Copper Case.*
1-light	4 feet	125	**30/-**	**5/-** extra.	3-light	12 feet	400	**52/6**	**6/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*		*1-Light.*	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**	Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**	Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made
Case contains . .	*80*	*18*	*18*	*12*	Welsbach Mantles, each **6d.** subject as usual.				

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

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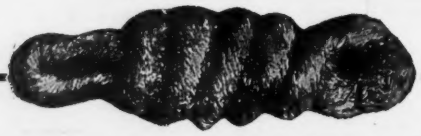

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Lead Wool Joints are Twice as Strong as Cast Lead Joints and cost 33⅓ per cent. less.

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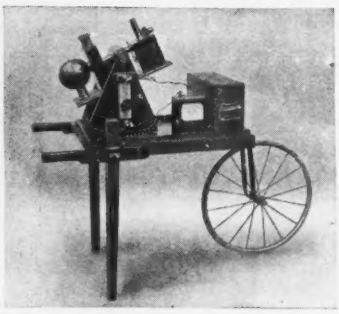

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[See Illustrated Advertisement, June 14, p. 728.]

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THE NEW RETORT

Will withstand high temperatures and is **Guaranteed not to Contract or Soften** under Heat.

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give careful and prompt attention to execution of all Orders, and consequently give all-round satisfaction.

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Heavy Quality.

Brilliant Light.

FURTHER IMPROVEMENTS BUT NO INCREASE IN PRICE.

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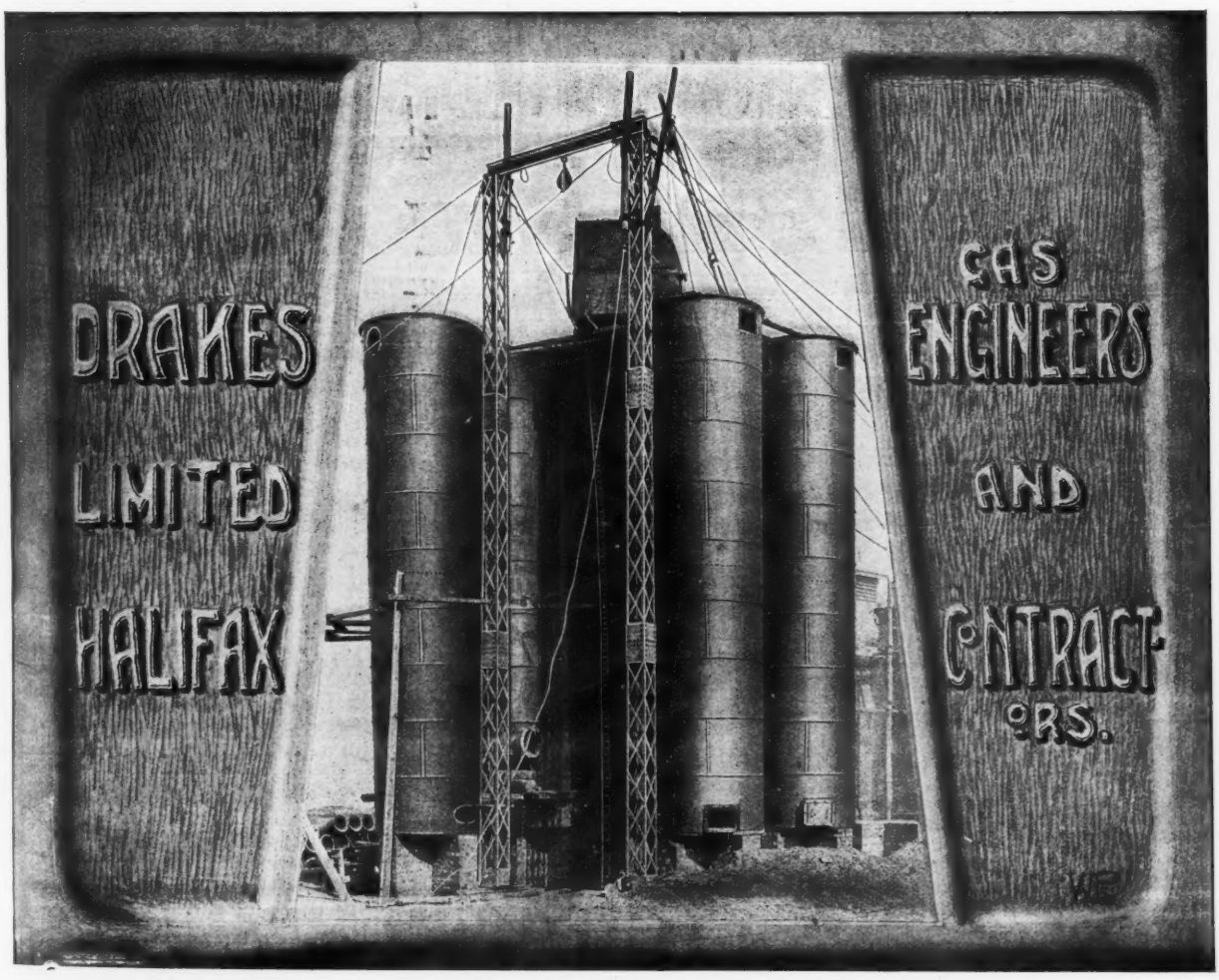
CONTRACTORS TO THE CHIEF GASWORKS IN THE BRITISH ISLES AND ABROAD.
FOR
RETORTS
MANUFACTURED FROM OUR CAREFULLY SELECTED AND WELL SEASONED STOCK OF OLD MINE FIRE CLAY.



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HIGH PRESSURE GAS.

Rotary Compressor driven by direct coupled Gas-Engine on one base.

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Also made for driving by Steam Belt, or Electric Motor.

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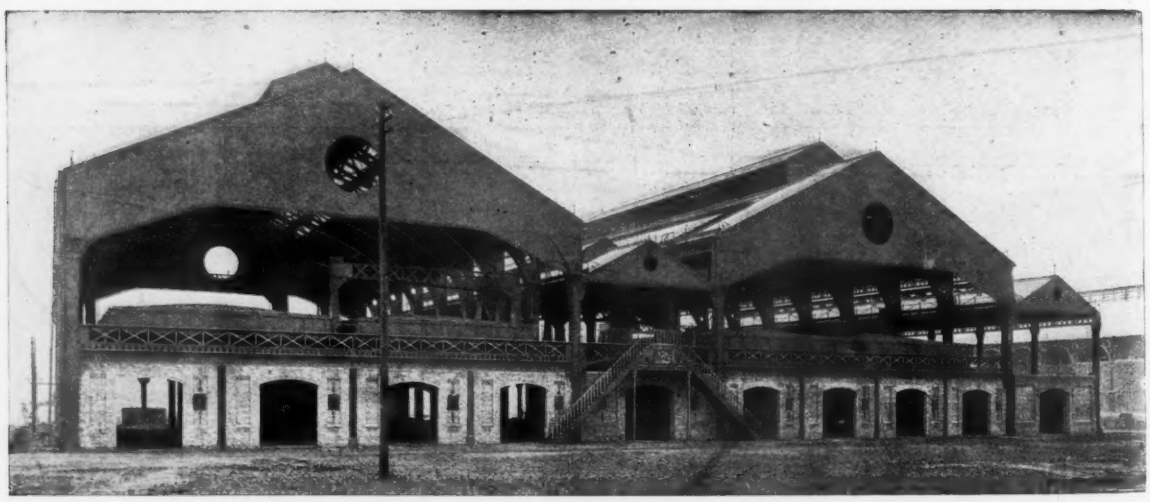
In WASHER-SCRUBBERS, WATER-TUBE CONDENSERS, LIVESEY WASHERS, P. & A. EXTRACTORS, RETORT MOUTHPIECES, and DRY-LUTE PURIFIERS.



The above is a view of a Purifying Plant entirely undertaken by us for the Manchester Corporation, to the Designs of their Engineer, J. G. NEWBIGGING, Esq., it covers 4444 square yards and contains Twelve Purifiers with space for an additional Four, each 35 feet square, with a total area of 14,700 square feet. Upwards of 2490 Tons of Steel and Iron were used.

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Printed and Published by WALTER KING, at No. 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, July 5, 1910.